

{STIC Search}

HERTZOG 10/803,491

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FILE 'REGISTRY' ENTERED AT 20:38:34 ON 30 APR 2005
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FILE 'HCAPLUS' ENTERED AT 20:07:56 ON 30 APR 2005

L1 5425 S FLORES LIRA ?/AU OR LIRA FLORES ?/AU OR FLORES ?/AU OR
L2 936 S GARZA ?/AU OR DE GARZA ?/AU OR LA GARZA ?/AU OR DE LA G
L3 4 S L1 AND L2
SEL L3 1-4 RN

FILE 'REGISTRY' ENTERED AT 20:08:16 ON 30 APR 2005

L4 8 S E1-E8
L5 0 S L4 AND PB/ELS

FILE 'HCAPLUS' ENTERED AT 20:08:45 ON 30 APR 2005

L6 0 S FLORES-LIRA ?/AU
L7 5193 S PBSO4
L8 465 S 4PBO OR 4(W)PBO
L9 0 S (L1 OR L2) AND L7
L10 0 S (L1 OR L2) AND L8

FILE 'REGISTRY' ENTERED AT 20:10:59 ON 30 APR 2005

L11 101 S (PB(L)O)/ELS (L) 2/ELC.SUB
E LEAD MONOXIDE/CN
L12 1 S E3
E LEAD SULFATE/CN
L13 11 S E3-E15
L14 2 S E3

FILE 'HCA' ENTERED AT 20:13:27 ON 30 APR 2005

L15 30153 S L11 OR (LEAD# OR PB) (W) (OXIDE# OR MONOXIDE#).
L16 30964 S L12 OR PBO OR 4PBO
L17 5238 S L13 OR (LEAD# OR PB) (W) (SULFATE# OR SULPHATE# OR MONOSU
L18 6052 S L14 OR PBSO4
L19 2096 S (L11 (L) RACT/RL) OR (L12 (L) RACT/RL)
L20 210 S (L13 (L) RACT/RL) OR (L14 (L) RACT/RL)
L21 49 S L19 AND L20
L22 206041 S BATTERY OR BATTERIES OR (ELECTROCHEM? OR ELECTROLY? OR
L23 93199 S PASTE# OR PASTING#
L24 256150 S SOLIDSTAT? OR SOLID?(2A) (STATE# OR PHASE#)
L25 165476 S HETEROG?
L26 13 S L21 AND L22

L27 3 S L21 AND L23
L28 5 S L21 AND L24
L29 0 S L21 AND L25
L30 584 S DEAGGLOM? OR DE(A)AGGLOM?
L31 0 S L21 AND L30
L32 1968 S (L15 OR L16) AND (L17 OR L18)
L33 608 S L32 AND L22
L34 256 S L32 AND L23
L35 76 S L32 AND L24
L36 16 S L32 AND L25
L37 0 S L32 AND L30
L38 12316 S SIEVING# OR SIEVEING# OR SIEVED
L39 0 S L21 AND L38
L40 3 S L32 AND L38
L41 211 S L33 AND L34
L42 20 S L33 AND L35
L43 2 S L34 AND L35
L44 2 S L33 AND L34 AND L35
L45 2 S L41 AND L42
L46 462 S 4PBO OR 4(W)PBO
L47 77 S L33 AND L46
L48 56 S L34 AND L46
L49 9 S L35 AND L46
L50 2 S L36 AND L46
L51 38837 S (L24 OR L25) (3A) (REACT? OR RX# OR RXN#)
L52 3 S L21 AND L51
L53 28 S L32 AND L51
L54 24 S L53 AND L16
L55 26 S L53 AND L18
L56 28 S L53 AND (L22 OR L23 OR L24 OR L25 OR L30 OR L38)
L57 22 S L27 OR L28 OR L40 OR L43 OR L44 OR L45 OR L49 OR L50 OR
L58 23 S (L26 OR L36) NOT L57
L59 31 S (L42 OR L56) NOT (L57 OR L58)

=> file hca

FILE 'HCA' ENTERED AT 20:38:49 ON 30 APR 2005

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=> d 157 1-22 cbib abs hitstr hitind

L57 ANSWER 1 OF 22 HCA COPYRIGHT 2005 ACS on STN

141:399562 Speciation of PM10 Sources of Airborne Nonferrous Metals
within the 3-km Zone of Lead/Zinc Smelters. Batonneau, Yann;

Bremard, Claude; Gengembre, Leon; Laureyns, Jacky; Le Maguer, Agnes; Le Maguer, Didier; Perdrix, Esperanza; Sobanska, Sophie (Laboratoire de Spectrochimie IR et Raman, UMR-CNRS 8516, CERLA FR-CNRS 2416, Universite de Lille I, Villeneuve d'Ascq, F-59655, Fr.). Environmental Science and Technology, 38(20), 5281-5289 (English) 2004. CODEN: ESTHAG. ISSN: 0013-936X. Publisher: American Chemical Society.

AB The purpose of this study was to est. the speciation of PM10 sources of airborne Pb, Zn, and Cd metals (PM10 is an aerosol std. of aerodynamic diam. less than 10 μm) in the atm. of a 3-km zone surrounding lead/zinc facilities in operation for a century. Many powd. samples were collected in stacks of working units (grilling, furnace, and refinery), outdoor storage (ores, recycled materials), surrounding waste slag (4 megatons), and polluted topsoils (3 km). PM10 samples were generated from the raw powders by using artificial resuspension and collection devices. The bulk PM10 multielemental analyses were detd. by inductively coupled plasma-at. emission spectrometry (ICP-AES). The proportions in mass of Pb (50%), Zn (40%), and Cd (1%) contents and assocd. metals (traces) reach the proportions of corresponding raw powd. samples of ores, recycled materials, and fume-size emissions of plants without specific enrichment. In contrast, Pb (8%) and Zn (15%) contents of PM10 of the slag deposit were found to be markedly higher than those of raw dust, Pb (4%) and Zn (9%), resp. In the same way, Pb (0.18%), Zn (0.20%), and Cd (0.004%) were enriched by 1.7, 2.1, and 2.3 times, resp., in PM10 as compared with raw top-soil corresponding values. X-ray wavelength dispersive electron-microprobe (EM-WDS) microanal. did not indicate well-defined phases or simple stoichiometries of all the PM10 samples at the level of the spatial resoln. (1 μm). XPS indicated that minor elements such as Cd, Hg, and C are more concd. on the particle surface than in the bulk of PM10 generated by the smelting processes. XPS provided also the av. speciation of the surface of PM10; Pb is mainly represented as **PbSO₄**, Zn as ZnS, and Cd as CdS or CdSO₄, and small amts. of coke were also detected. The speciation of bulk PM10 crystd. compds. was deduced from XRD diffractograms with a raw estn. of the relative quantities. PbS and ZnS were found to be the major phases in PM10 generated by the smelting facilities, with **PbSO₄**, **PbSO₄**. **PbO**, **PbSO₄**. **4PbO**, Pb metal, and ZnO as minor phases. The slag waste PM10 was found to contain some amts. of PbCO₃, **PbSO₄**. **PbO**, and ZnFe₂O₄ phases. The large **heterogeneity** at the level of the individual particle generates severe overlap of chem. information, even at the micrometer scale using electron microprobe (WDS) and Raman microprobe techniques. Fortunately, scanning Raman microspectrometry combined with Simple-to-use Interactive Self-modeling Mixt. Anal. (SIMPLISMA) performed the PM10 speciation at the level of individual particles. The speciation of major Pb, Zn, and Cd compds. of PM10 stack emissions and wind blown dust of

ores and recycled materials were found to be **PbSO₄**,
PbSO₄.PbO, **PbSO₄.4PbO**,
PbO, metallic Pb, ZnS, ZnO, and CdS. The PM10 dust of slag
waste was found to contain PbCO₃, Pb(OH)₂.2PbCO₃, **PbSO₄**.
PbO, and ZnS, while PM10-bound Pb, Zn of the topsoils
contain Pb₅(PO₄)₃Cl and ZnFe₂O₄, as well as Pb(II) and Zn(II)
compds. adsorbed on Fe(III) oxides and in assocn. with clays.

IT 1317-36-8, **Lead oxide (PbO)**,
analysis 7446-14-2 12036-76-9, **Lead
oxide sulfate (Pb₂O(SO₄))**

RL: ANT (Analyte); POL (Pollutant); ANST (Analytical study); OCCU
(Occurrence)

(speciation of PM10 particulate sources of airborne nonferrous
metals within the 3-km zone of lead/zinc smelters in France)

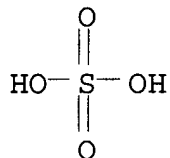
RN 1317-36-8 HCA

CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)

O=Pb

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

RN 12036-76-9 HCA

CN Lead oxide sulfate (Pb₂O(SO₄)) (7CI, 8CI, 9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	1	17778-80-2
O4S	1	14808-79-8
Pb	2	7439-92-1

CC 59-2 (Air Pollution and Industrial Hygiene)

Section cross-reference(s): 54

IT 598-63-0 1306-23-6, Cadmium sulfide (CdS), analysis 1309-36-0,
Pyrite, analysis 1314-13-2, Zinc oxide (ZnO), analysis
1314-87-0, Lead sulfide (PbS) 1314-98-3, Zinc sulfide (ZnS),

analysis 1317-36-8, **Lead oxide** (**PbO**), analysis 1317-60-8, Hematite, analysis 1319-46-6
 7439-89-6, Iron, analysis 7439-92-1, Lead, analysis 7439-97-6,
 Mercury, analysis 7440-09-7, Potassium, analysis 7440-21-3,
 Silicon, analysis 7440-38-2, Arsenic, analysis 7440-43-9,
 Cadmium, analysis 7440-44-0, Carbon, analysis 7440-50-8, Copper,
 analysis 7440-66-6, Zinc, analysis 7440-70-2, Calcium, analysis
7446-14-2 7704-34-9, Sulfur, analysis 7782-41-4,
 Fluorine, analysis 7782-44-7, Oxygen, analysis 7782-50-5,
 Chlorine, analysis 10124-36-4, Cadmium sulfate **12036-76-9**
 , **Lead oxide** sulfate ($\text{Pb}_2\text{O}(\text{SO}_4)$) 12063-19-3,
 Iron zinc oxide (Fe_2ZnO_4) 12065-90-6, **Lead oxide**
 sulfate ($\text{Pb}_5\text{O}_4(\text{SO}_4)$) 12138-06-6, Wurtzite 12169-28-7, Sphalerite
 12179-39-4, Galena 13397-24-5, Gypsum, analysis 14594-79-7,
 Anglesite

RL: ANT (Analyte); POL (Pollutant); ANST (Analytical study); OCCU
 (Occurrence)

(speciation of PM10 particulate sources of airborne nonferrous
 metals within the 3-km zone of lead/zinc smelters in France)

L57 ANSWER 2 OF 22 HCA COPYRIGHT 2005 ACS on STN

141:81127 From rocksalt to perovskite: a metathesis route for the
 synthesis of perovskite oxides of current interest. Mandal, Tapas
 Kumar; Gopalakrishnan, J. (Solid State and Structural Chemistry
 Unit, Indian Institute of Science, Bangalore, 560 012, India).
 Journal of Materials Chemistry, 14(8), 1273-1280 (English) 2004.
 CODEN: JMACEP. ISSN: 0959-9428. Publisher: Royal Society of
 Chemistry.

AB **Solid state metathesis reactions**

between Li contg. rocksalt metal oxides and appropriate La/alk.
 earth metal oxychloride/chloride provide a convenient route for the
 synthesis of several perovskite oxides of current interest, such as
 LaCoO_3 , LaMnO_3 , AMnO_3 and ATiO ($A = \text{Ca, Sr, Ba}$). Similarly,
 metathesis reactions between $\text{Li}_2\text{TiO}_3/\text{Li}_2\text{ZrO}_3$ and PbSO_4 (instead of
 PbCl_2) yield PbTiO_3 , PbZrO_3 and $\text{PbZr}_{1-x}\text{Ti}_x\text{O}_3$ perovskites. BaPbO_3
 and superconducting $\text{BaPb}_{0.75}\text{Bi}_{0.25}\text{O}_3$ could also be synthesized by
 the metathesis reaction between $\text{Li}_2\text{PbO}_3/\text{Li}_2(\text{Pb,Bi})\text{O}_3$ and
 $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$. Uniformly in all cases, the perovskite oxides
 were obtained as loosely connected submicron sized particles at
 considerably lower temps. than those usually employed for their
 synthesis by ceramic methods.

IT **1309-60-0**, Lead oxide (PbO_2) **7446-14-2**, Lead
 sulfate (PbSO_4)

RL: RCT (Reactant); **RACT (Reactant or reagent)**
 (**solid state** metathesis of rocksalt oxides
 for synthesis of perovskite oxides)

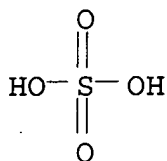
RN 1309-60-0 HCA

CN Lead oxide (PbO_2) (8CI, 9CI) (CA INDEX NAME)



RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

CC 78-2 (Inorganic Chemicals and Reactions)

Section cross-reference(s): 68

ST transition metal rare earth perovskite oxide prepn rocksalt;
metathesis **solid state** rocksalt oxide perovskite
prepn thermodyn; **solid state** enthalpy entropy
free energy metathesis

IT Transition metal oxides

RL: SPN (Synthetic preparation); PREP (Preparation)

(alk. earth oxides; **solid state** metathesis of
rocksalt oxides for synthesis of perovskite oxides)

IT **Solid state reaction** enthalpy

(metathesis of rocksalt oxides for synthesis of perovskite
oxides)

IT Entropy

Free energy

(**solid state**; metathesis of rocksalt oxides
for synthesis of perovskite oxides)

IT Metathesis

(**solid state**; of rocksalt oxides for
synthesis of perovskite oxides)

IT Alkaline earth oxides

RL: SPN (Synthetic preparation); PREP (Preparation)

(transition metal oxides; **solid state**
metathesis of rocksalt oxides for synthesis of perovskite oxides)

IT 554-13-2, Lithium carbonate (Li₂CO₃) 1309-60-0, Lead oxide
(PbO₂) 1310-66-3, Lithium hydroxide (LiOH) monohydrate

1312-81-8, Lanthanum oxide (La₂O₃) 1314-23-4, Zirconium oxide
(ZrO₂), **reactions** 5965-38-8 6556-16-7

7446-14-2, Lead sulfate (PbSO₄) 10043-52-4, Calcium

chloride (CaCl₂), **reactions** 10361-37-2, Barium chloride

(BaCl₂), **reactions** 10476-85-4, Strontium chloride

(SrCl₂) 12125-02-9, Ammonium chloride (NH₄Cl), **reactions**

12230-71-6, Barium hydroxide ($\text{Ba}(\text{OH})_2$) octahydrate 13463-67-7,
 Titanium oxide (TiO_2), **reactions** 709673-54-1, Bismuth
 lead lithium oxide ($\text{Bi}_{0.25}\text{Pb}_{0.75}\text{Li}_2\text{O}_3$)

RL: RCT (Reactant); **RACT (Reactant or reagent)**

(**solid state** metathesis of rocksalt oxides
 for synthesis of perovskite oxides)

IT 12031-82-2P, Lithium titanate (Li_2TiO_3) 12031-83-3P, Lithium
 zirconate (Li_2ZrO_3) 12162-79-7P, Lithium manganese oxide (LiMnO_2)
 12163-00-7P, Lithium manganese oxide (Li_2MnO_3) 12190-79-3P, Cobalt
 lithium oxide (CoLiO_2) 13759-25-6P, Lanthanum chloride oxide
 (LaClO) 170232-55-0P, Lead lithium oxide (PbLi_2O_3)
 RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation);
 RACT (Reactant or reagent)

(**solid state** metathesis of rocksalt oxides
 for synthesis of perovskite oxides)

IT 12016-86-3P, Cobalt lanthanum oxide (CoLaO_3) 12031-12-8DP,
 Lanthanum manganese oxide (LaMnO_3), oxygen-excess 12031-12-8P,
 Lanthanum manganese oxide (LaMnO_3) 12047-25-5P, Barium lead oxide
 (BaPbO_3) 12049-50-2P, Calcium titanium oxide (CaTiO_3)
 12163-45-0P, Manganese strontium oxide (MnSrO_3) 12177-86-5P,
 Calcium manganese oxide (CaMnO_3) 12230-80-7P, Barium manganese
 oxide (BaMnO_3) 12534-46-2P, Lead titanium zirconium oxide
 ($\text{PbTi}_{0.5}\text{Zr}_{0.5}\text{O}_3$) 107068-05-3P, Barium bismuth lead oxide
 ($\text{BaBi}_{0.25}\text{Pb}_{0.75}\text{O}_3$) 111242-35-4P, Lead titanium zirconium oxide
 ($\text{PbTi}_{0.52}\text{Zr}_{0.48}\text{O}_3$) 169964-77-6P, Calcium lanthanum manganese oxide
 ($\text{Ca}_{0.33}\text{La}_{0.67}\text{MnO}_3$)

RL: SPN (Synthetic preparation); PREP (Preparation)

(**solid state** metathesis of rocksalt oxides
 for synthesis of perovskite oxides)

IT 12047-27-7P, Barium titanium oxide (BaTiO_3), preparation
 12060-00-3P, Lead titanium oxide (PbTiO_3) 12060-01-4P, Lead
 zirconium oxide (PbZrO_3) 12060-59-2P, Strontium titanium oxide
 (SrTiO_3)

RL: PRP (Properties); SPN (Synthetic preparation); PREP
 (Preparation)

(thermodn. parameters in **solid state**
 metathesis of rocksalt oxides for synthesis of perovskite oxides)

L57 ANSWER 3 OF 22 HCA COPYRIGHT 2005 ACS on STN

139:216829 Interactions between lignosulphonates and the components of
 the lead-acid **battery** Part 1. Adsorption isotherms.
 Myrvold, Bernt O. (Borregaard LignoTech, Sarpsborg, N-1709, Norway).
 Journal of Power Sources, 117(1-2), 187-202 (English) 2003. CODEN:
 JPSODZ. ISSN: 0378-7753. Publisher: Elsevier Science B.V..

AB The expander performs at least five different tasks in the
battery. It is a fluidizer for the neg. **paste**.
 It controls the formation stage of the **battery**. It
 controls the shape and size of the **lead sulfate**
 crystals formed upon discharge, and thus prevents the sintering of

the active mass. It controls the rate of the lead to **lead sulfate** oxidn. during discharge. Finally, it affects the charge acceptance. To gain more understanding of these different effects the interaction between lead, lead(II) oxide, lead(IV) oxide, **lead sulfate**, barium sulfate and carbon black and the exptl. lignosulfonate (LS) expander UP-414 was studied. The authors also compared with Vanisperse A and several other lignosulfonates, to elucidate the mechanisms operating. In most cases, the authors have studied concn. ranges that are both higher and lower than those normally encountered in **batteries**. There is no adsorption of lignosulfonates to pure lead surfaces. Adsorption to **lead sulfate** is a slow process. In the presence of lead ions lignosulfonates will also adsorb to lead. The adsorption to lead(II) oxide is a fast process, and a strong adsorption occurs. In all these cases, it is preferably the high mol. wt. fraction that interacts with the solid surfaces. Lead ions leaching from the surface complexes with lignosulfonates to give a more hydrophobic species. This allows the normally neg. charged lignosulfonate to adsorb to the neg. charged substrates. The lignosulfonates have an ability to complex lead ions and keep them solvated. This confirms previous observations of the lignosulfonates ability to promote the dissoln.-pptn. mechanism for **lead sulfate** formation on the expense of the **solid-state** reaction.

IT 1317-36-8, **Lead oxide (PbO)**,
processes 7446-14-2, **Lead sulfate (PbSO4)**

RL: FMU (Formation, unclassified); PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); FORM (Formation, nonpreparative); PROC (Process)

(adsorption isotherms and interactions between lignosulfonates and the components of lead-acid **battery**)

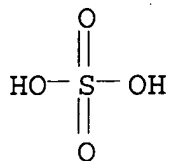
RN 1317-36-8 HCA

CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)

O=Pb

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

IT 1309-60-0, **Lead oxide** (PbO₂)
 RL: PEP (Physical, engineering or chemical process); PRP
 (Properties); PYP (Physical process); PROC (Process)
 (adsorption isotherms and interactions between lignosulfonates
 and the components of lead-acid **battery**)
 RN 1309-60-0 HCA
 CN Lead oxide (PbO₂) (8CI, 9CI) (CA INDEX NAME)



CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 49, 68
 ST lignosulfonate **lead sulfate** oxide acid
battery adsorption isotherm complexes
 IT Adsorption
 Battery anodes
 Zeta potential
 (adsorption isotherms and interactions between lignosulfonates
 and the components of lead-acid **battery**)
 IT Carbon black, processes
 RL: PEP (Physical, engineering or chemical process); PRP
 (Properties); PYP (Physical process); PROC (Process)
 (adsorption isotherms and interactions between lignosulfonates
 and the components of lead-acid **battery**)
 IT Secondary **batteries**
 (lead-acid; adsorption isotherms and interactions between
 lignosulfonates and the components of lead-acid **battery**
)
 IT Molecular weight
 (of adsorbing and desorbing lignosulfonate species; adsorption
 isotherms and interactions between lignosulfonates and the
 components of lead-acid **battery**)
 IT Solvation
 (of lead complexes, oxides, and sulfates; adsorption isotherms
 and interactions between lignosulfonates and the components of
 lead-acid **battery**)

- IT Sulfonic acids, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); PROC (Process)
(salts, lignosulfonates, UP 391, UP 392, UP 413, UP 415, UP 416, UP 417, UP 418; adsorption isotherms and interactions between lignosulfonates and the components of lead-acid **battery**)
- IT 1317-36-8, Lead oxide (PbO), processes 7446-14-2, Lead sulfate (PbSO₄) 7757-82-6, Sodium sulfate, processes
RL: FMU (Formation, unclassified); PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); FORM (Formation, nonpreparative); PROC (Process)
(adsorption isotherms and interactions between lignosulfonates and the components of lead-acid **battery**)
- IT 64-19-7, Acetic acid, uses
RL: NUU (Other use, unclassified); USES (Uses)
(adsorption isotherms and interactions between lignosulfonates and the components of lead-acid **battery**)
- IT 1309-60-0, Lead oxide (PbO₂)
7727-43-7, Barium sulfate (BaSO₄) 15347-57-6, Lead acetate 259154-21-7, UP-393
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); PROC (Process)
(adsorption isotherms and interactions between lignosulfonates and the components of lead-acid **battery**)
- IT 7664-93-9, Sulfuric acid, reactions
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(adsorption isotherms and interactions between lignosulfonates and the components of lead-acid **battery**)
- IT 8061-51-6, Vanisperse A
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); PROC (Process)
(adsorption onto lead, **lead oxides**, and carbon black; adsorption isotherms and interactions between lignosulfonates and the components of lead-acid **battery**)
- IT 338460-66-5, Borregaard UP-414
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); PROC (Process)
(adsorption onto lead, **lead oxides**, carbon black, and barium sulfate; adsorption isotherms and interactions between lignosulfonates and the components of lead-acid **battery**)
- IT 7439-92-1, Lead, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); PROC (Process)

(pure and native (coated with thin film **PbO**);
adsorption isotherms and interactions between lignosulfonates and
the components of lead-acid **battery**)

L57 ANSWER 4 OF 22 HCA COPYRIGHT 2005 ACS on STN

134:125201 Modified predominance diagrams for gas-solid reactions.
Constantineau, J. P. (Chemical and Biological Engineering
Department, The University of British Columbia, Vancouver, BC, V6T
1Z4, Can.). Metallurgical and Materials Transactions B: Process
Metallurgy and Materials Processing Science, 31B(6), 1429-1437
(English) 2000. CODEN: MTBSEO. ISSN: 1073-5615. Publisher:
Minerals, Metals & Materials Society.

AB A new type of diagram is proposed to describe gas-solid reactions.
These diagrams, called modified predominance diagrams, unite
thermodn. and kinetics into a new tool that should prove useful in
many metallurgical and chem. systems. They are created from
predominance diagrams by applying a math. transformation derived
from basic transport and chem. rate phenomena. The diagrams predict
the reaction product for given kinetic conditions and bulk atm.
compsns. They consider the reaction from a single solid reactant to
any solid product contained in the corresponding predominance
diagram. The diagrams are similar to predominance diagrams except
that some lines are curved and binary regions are created to satisfy
both the equil. and kinetic requirements. The curvature results
from the presence of gaseous reaction products at the solid reactant
surface. The diagrams are developed in this article using the
oxidn. of a metal sulfide as an example. They show that the
reaction path can be influenced even if the system is rate-limited
by chem. kinetics. For a fixed bulk oxygen concn., another diagram
can be created, which can predict kinetic conditions under which
mass transport no longer influences the reaction path predicted by
thermodn.

IT 1309-60-0, Lead oxide PbO2 1317-36-8, Lead oxide
PbO, reactions 7446-14-2, Lead sulfate PbSO4
RL: PEP (Physical, engineering or chemical process); RCT (Reactant);
PROC (Process); **RACT (Reactant or reagent)**
(modified predominance diagrams for gas-solid reactions)

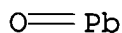
RN 1309-60-0 HCA

CN Lead oxide (PbO2) (8CI, 9CI) (CA INDEX NAME)

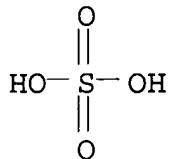


RN 1317-36-8 HCA

CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)



RN 7446-14-2 HCA
CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

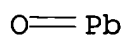
CC 78-9 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 55, 69
ST predominance **phase** diagram gas **solid**
reaction mass transport no
IT 1309-60-0, Lead oxide PbO2 1314-87-0, Lead sulfide PbS
1317-36-8, Lead oxide PbO, reactions 7439-92-1, Lead,
reactions 7446-14-2, Lead sulfate PbSO4
RL: PEP (Physical, engineering or chemical process); RCT (Reactant);
PROC (Process); **RACT (Reactant or reagent)**
(modified predominance diagrams for gas-solid reactions)

L57 ANSWER 5 OF 22 HCA COPYRIGHT 2005 ACS on STN
129:282605 Process for the recovery of lead from spent batteries.
Margulis, Efim (Margulead Ltd., Israel). U.S. US 5827347 A
19981027, 7 pp. (English). CODEN: USXXAM. APPLICATION: US
1996-686623 19960724. PRIORITY: IL 1996-118397 19960523.

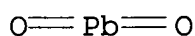
AB A process for the recovery of lead from spent battery **paste**
and lead contg. materials. The process includes the steps of
calcination of a spent **paste** treated with an alkali
carbonate or hydroxide or any mixt. thereof, and elemental sulfur at
a temp. of up to 600.degree. C., followed by washing with water.
The calcined and washed **paste** is dissolved in an alkali
molten electrolyte, and lead is electrowinned from the alkali molten
electrolyte. The spent electrolyte is reused in the process.

IT 1317-36-8, Lead oxide, properties
RL: PEP (Physical, engineering or chemical process); PRP
(Properties); RCT (Reactant); PROC (Process); **RACT (Reactant or reagent)**
(formation in calcination of blend contg. lead sulfate, lead
dioxide, alkali carbonate and sulfur; recovery of lead from
materials contg.)

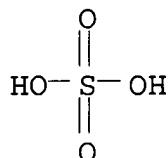
RN 1317-36-8 HCA
CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)



IT 1309-60-0, Lead dioxide 7446-14-2, Lead sulfate
 RL: PEP (Physical, engineering or chemical process); PRP
 (Properties); RCT (Reactant); PROC (Process); **RACT (Reactant or reagent)**
 (recovery of lead from materials contg.)
 RN 1309-60-0 HCA
 CN Lead oxide (PbO₂) (8CI, 9CI) (CA INDEX NAME)



RN 7446-14-2 HCA
 CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

IC ICM C25C003-34
 INCL 075419000
 CC 72-8 (Electrochemistry)
 Section cross-reference(s): 56
 IT 1317-36-8, Lead oxide, properties
 RL: PEP (Physical, engineering or chemical process); PRP
 (Properties); RCT (Reactant); PROC (Process); **RACT (Reactant or reagent)**
 (formation in calcination of blend contg. lead sulfate, lead
 dioxide, alkali carbonate and sulfur; recovery of lead from
 materials contg.)
 IT 1309-60-0, Lead dioxide 7446-14-2, Lead sulfate
 RL: PEP (Physical, engineering or chemical process); PRP
 (Properties); RCT (Reactant); PROC (Process); **RACT (Reactant or reagent)**
 (recovery of lead from materials contg.)
 L57 ANSWER 6 OF 22 HCA COPYRIGHT 2005 ACS on STN
 128:174363 Crystal structure of tetrabasic lead
 sulfate (4PbO.cntdot.PbSO₄). An

intermediate phase in the production of lead-acid batteries.

Steele, Ian M.; Pluth, Joseph J. (Dep. Geophysical Sci., Univ. Chicago, Chicago, IL, 60637, USA). Journal of the Electrochemical Society, 145(2), 528-533 (English) 1998. CODEN: JESOAN. ISSN: 0013-4651. Publisher: Electrochemical Society.

- AB Demand for improved battery systems for elec. vehicles and power sources in general suggests the need for more accurate descriptions of the **solid-state** and electrochem. reactions which may affect active-material usage. Tetrabasic **lead sulfate** (**4PbO.cntdot.PbSO4**) is an intermediate phase commonly formed during prodn. of Pb-acid batteries and, with tribasic **lead sulfate**, detd. some battery characteristics. Single-crystal x-ray data were used to det. its structure to a final $R_w = 0.024$ ($a\ 7.297$, $b\ 11.698$, and $c\ 11.498$.ANG., .beta. 90.93° , $P2_1/c$). At. coordinates are given. Its structure is closely related to that of tetragonal **PbO**, except that one of six Pb sites is occupied by **SO4**. This sulfate groups shows either dynamic (librations) or static disorder, but there is no evidence in the authors' crystal for Pb-S disorder as proposed by other x-ray studies. This detn. and that for tribasic **lead sulfate** complete structural detns. of the major phases formed during prodn. of Pb-acid batteries. These structural models allow Rietveld studies using either x-ray or neutron-diffraction data to evaluate properties such as crystallinity, at. ordering, and reactions during curing and cycling. The structures of tetrabasic and tribasic **lead sulfate**, as well as tetragonal and orthorhombic **PbO**, have basic features in common. These similarities suggest that there may be structural control during some reactions whereby **heterogeneous** nucleation influences the products in concert with external variables such as temp., humidity, and pH.
- CC 75-8 (Crystallography and Liquid Crystals)
Section cross-reference(s): 52
- ST structure tetrabasic **lead sulfate** acid battery
- IT Primary batteries
(lead-acid; crystal structure of tetrabasic **lead sulfate**; intermediate phase in prodn. of lead-acid batteries)
- IT Crystal structure
(of tetrabasic **lead sulfate**)
- IT 12065-90-6, Tetrabasic **lead sulfate**
RL: DEV (Device component use); PRP (Properties); USES (Uses)
(crystal structure of tetrabasic **lead sulfate** ; intermediate phase in prodn. of lead-acid batteries)

L57 ANSWER 7 OF 22 HCA COPYRIGHT 2005 ACS on STN

127:265871 Recovery of lead from lead sulfate-containing wastes by smelting process. Suganuma, Toshio; Kuwabara, Masao; Miyagawa, Masaki (Mitsubishi Materials Corp., Japan; Hosokura Seiren K. K.).

Jpn. Kokai Tokkyo Koho JP 09241769 A2 19970916 Heisei, 6 pp.
(Japanese). CODEN: JKXXAF. APPLICATION: JP 1996-52950 19960311.

AB The process consists of feeding PbSO₄-contg. wastes (e.g., Pb storage battery **pastes**, polymetallic ores from Pb smelting or processing) and a C source (e.g., coke) as a heat source to a sintering furnace, sintering so that PbSO₄ is decompd. and converted to PbO in the presence of CO (from C source) and Pb is prevented from being produced, crushing the sintered body, and smelting redn. in a blast furnace. A large amt. of wastes can be efficiently treated at a low cost by using a Pb smelting app.

IT **1317-36-8P**, Lead oxide (PbO), preparation
RL: PNU (Preparation, unclassified); RCT (Reactant); PREP (Preparation); **RACT (Reactant or reagent)**
(recovery of lead from lead sulfate-contg. wastes by sintering with carbon heat source and smelting redn.)

RN 1317-36-8 HCA

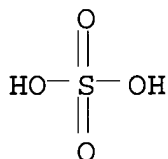
CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)

O=Pb

IT **7446-14-2**, Lead sulfate
RL: RCT (Reactant); **RACT (Reactant or reagent)**
(sintering of; recovery of lead from lead sulfate-contg. wastes by sintering with carbon heat source and smelting redn.)

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

IC ICM C22B013-02

ICS B09B003-00; C01G021-20

CC 54-2 (Extractive Metallurgy)

Section cross-reference(s): 60

IT 630-08-0P, Carbon monoxide, preparation **1317-36-8P**, Lead oxide (PbO), preparation

RL: PNU (Preparation, unclassified); RCT (Reactant); PREP (Preparation); **RACT (Reactant or reagent)**

(recovery of lead from lead sulfate-contg. wastes by sintering with carbon heat source and smelting redn.)

IT 7446-14-2, Lead sulfate

RL: RCT (Reactant); **RACT (Reactant or reagent)**

(sintering of; recovery of lead from lead sulfate-contg. wastes by sintering with carbon heat source and smelting redn.)

L57 ANSWER 8 OF 22 HCA COPYRIGHT 2005 ACS on STN

125:179819 Process for the hydrometallurgical and electrochemical treatment of the active mass of exhausted lead batteries to obtain electrolytic lead and elemental sulfur. Casadei Manequini, Adilson (Ecwin S.R.L., Italy). Eur. Pat. Appl. EP 724306 A1 19960731, 9 pp. DESIGNATED STATES: R: DE, FR, GB, IT. (English). CODEN: EPXXDW. APPLICATION: EP 1996-200096 19960116. PRIORITY: CA 1995-2141099 19950125.

AB A hydrometallurgical and electrochem. process for treating exhausted Pb batteries, in particular the active mass and the electrolyte, is described, having as products electrolytically obtained Pb and elemental S. The active mass (**paste**) obtained from the mech. processing of the exhausted batteries, consisting mainly of Pb sulfate and PbO₂, is dispersed in a dil. H₂SO₄ soln. and then reacted with a Na₂S soln. to convert all the Pb compds. present into insol. PbS and Na₂SO₄. After filtration, the Na₂SO₄ soln. is evapd. to obtain the anhyd. salt. From this, by thermal redn. with C, the Na₂S is reformed for use in treating further **paste**. The PbS obtained in this manner is leached with an electrolyte based on ferric fluoroborate, which oxidizes the sulfide to elemental S and solubilizes the Pb in the form of fluoroborate. After filtering the residue contg. the elemental S, the Pb fluoroborate soln. is electrolyzed in a diaphragm cell to obtain electrolytic Pb in the cathodic compartment and regenerate the ferric fluoroborate in the anodic compartment for use in leaching further sulfide.

IT 1309-60-0, Lead dioxide 7446-14-2, Lead sulfate

RL: PEP (Physical, engineering or chemical process); RCT (Reactant); TEM (Technical or engineered material use); PROC (Process);

RACT (Reactant or reagent); USES (Uses)

(hydrometallurgical and electrochem. treatment of active mass of Pb sulfate with PbO₂ from exhausted lead batteries to obtain electrolytic lead and elemental sulfur)

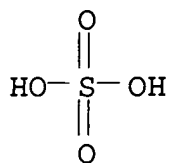
RN 1309-60-0 HCA

CN Lead oxide (PbO₂) (8CI, 9CI) (CA INDEX NAME)



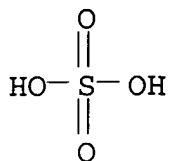
RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

- IC ICM H01M010-54
ICS C25C001-18; C22B013-00
- CC 72-2 (Electrochemistry)
Section cross-reference(s): 52
- IT **1309-60-0, Lead dioxide 7446-14-2, Lead sulfate**
RL: PEP (Physical, engineering or chemical process); RCT (Reactant);
TEM (Technical or engineered material use); PROC (Process);
RACT (Reactant or reagent); USES (Uses)
(hydrometallurgical and electrochem. treatment of active mass of
Pb sulfate with PbO₂ from exhausted lead batteries to obtain
electrolytic lead and elemental sulfur)
- L57 ANSWER 9 OF 22 HCA COPYRIGHT 2005 ACS on STN
110:98832 Manufacture of tubular lead-acid battery cathodes. Kato,
Naoyuki (Furukawa Battery Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho
JP 63239772 A2 19881005 Showa, 3 pp. (Japanese). CODEN: JKXXAF.
APPLICATION: JP 1987-71724 19870327.
- AB In the manuf. of the the title cathodes by mixing powd. Pb and/or
PbO with dil. H₂SO₄ to form **PbSO₄**-contg. granules
and filling the granules into tubes, granules contg. .gtorsim.15%
PbSO₄ are selected (by **sieving**) for the filling.
Cathodes prepd. from these granules have higher capacity and longer
lifetime than control cathodes.
- IT **7446-14-2, Lead sulfate (PbSO₄)**
RL: USES (Uses)
(cathodes from active-mass granules contg., tubular, for
lead-acid batteries)
- RN 7446-14-2 HCA
- CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

IC ICM H01M004-57

ICS H01M004-16

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST battery tubular cathode **lead sulfate**

IT Cathodes

(battery, lead-acid, tubular, **lead sulfate** in
active-mass granules for)

IT **7446-14-2, Lead sulfate (PbSO₄**

)

RL: USES (Uses)

(cathodes from active-mass granules contg., tubular, for
lead-acid batteries)

L57 ANSWER 10 OF 22 HCA COPYRIGHT 2005 ACS on STN

105:230421 Charge for smelting lead from old lead batteries in a rotary oscillating furnace. Koperwas, Jan; Raj, Bronislaw; Slusarek, Mirosław; Smieszek, Zbigniew; Gabrys, Jan; Opalinski, Romuald; Bar, Tadeusz; Drzazgala, Jozef; Maciazka, Stanislaw; et al. (Zakłady Gorniczo-Hutnicze "Orzeł Biały", Pol.). Pol. PL 124188 B1 19860131, 3 pp. (Polish). CODEN: POXXA7. APPLICATION: PL 1980-227490 19801024.

AB Battery scrap contg. Pb, **Pb oxide, PbSO₄**

and bakelite plastic is mixed with 4.76% iron scrap having a particle size <20 mm, ground, and tumbled in a rotary drum for 3-5 min. Large bakelite particles are sepd. from the dispersion by **sieving**. The suspension is classified, concd., and filtered. Typically, the resulting filter cake contains 30 Pb and 35% Fe.

IC C22B007-00

CC 54-2 (Extractive Metallurgy)

L57 ANSWER 11 OF 22 HCA COPYRIGHT 2005 ACS on STN

102:223546 Thermal reactions of leadhillite Pb₄SO₄(CO₃)₂(OH)₂.

Milodowski, A. E.; Morgan, D. J. (Br. Geol. Surv., Geochem. Directorate, Keyworth, Nottingham, NG12 5GG, UK). Clay Minerals, 19(5), 825-41 (English) 1984. CODEN: CLMIAF. ISSN: 0009-8558.

AB Reactions undergone by leadhillite [1319-48-8] from the type

locality, on heating to 1000.degree.. were studied by DTA, thermal gravimetric anal., differential scanning calorimetry, evolved gas anal., continuous-heating X-ray diffraction, and IR and hot-stage microscopy. Intermediate decompn. products were identified by x-ray powder photog. At 80.degree., biaxial leadhillite inverts to a uniaxial phase with properties similar to those of susannite [88593-09-3], a naturally-occurring polymorph of leadhillite, but this higher-temp. modification only partially reverts to the original structure on cooling (up to 24 h at room temp. is required for complete revision). Between 250 and 600.degree. the mineral undergoes 2 decompn. reactions: **PbO.PbCO₃** and **PbO.PbSO₄** form during the first reaction (PbCO₃ may form in the initial stages) and **4PbO.PbSO₄** during the second. .alpha.-2PbO.**PbSO₄** appears at 650.degree. due to **solid-state** reaction between the other Pb oxysulfate products. Melting occurs at > 850.degree.. The reaction products are discussed in relation to the phase diagrams for the systems **PbO-CO₂** and **PbO-PbSO₄**.

IT 12036-93-0P

RL: PREP (Preparation)
(alpha-form, formation of)

RN 12036-93-0 HCA

CN Lead oxide sulfate (Pb₃O₂(SO₄)) (7CI, 8CI, 9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O	2	17778-80-2
O4S	1	14808-79-8
Pb	3	7439-92-1

IT 12036-76-9P

RL: FORM (Formation, nonpreparative); PREP (Preparation)
(formation of, by thermal decompn. of leadhillite)

RN 12036-76-9 HCA

CN Lead oxide sulfate (Pb₂O(SO₄)) (7CI, 8CI, 9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O	1	17778-80-2
O4S	1	14808-79-8
Pb	2	7439-92-1

CC 53-1 (Mineralogical and Geological Chemistry)

IT 12036-93-0P

RL: PREP (Preparation)
(alpha-form, formation of)

IT 12036-76-9P 12065-90-6P 12326-84-0P

RL: FORM (Formation, nonpreparative); PREP (Preparation)
(formation of, by thermal decompn. of leadhillite)

L57 ANSWER 12 OF 22 HCA COPYRIGHT 2005 ACS on STN

102:29258 Selective leaching of lead battery slime in acidic ferrous chloride solutions. Arai, Koichi; Arikawa, Tadashi; Kato, Masaki; Izaki, Toshio (Fac. Eng., Toyama Univ., Takaoka, Japan). Nippon Kinzoku Gakkaishi, 48(11), 1075-80 (Japanese) 1984. CODEN: NIKGAV. ISSN: 0369-4186.

AB The selective leaching of PbO₂ from battery slime in acidic FeCl₂ solns. was investigated from thermodyn. and kinetic aspects based on the exptl. results obtained on leaching rates, stoichiometry of the reaction, and x-ray diffraction anal. of the leaching products. The leaching rate of PbO₂ proceeds rapidly in the initial stage and it is directly proportional to the concn. of Fe²⁺ ions and the surface area of the battery slime. However, the dissoln. of PbSO₄ in battery slime is <12% under the same leaching conditions, and then the selective leaching of PbO₂ from the battery slime is possible. The overall reaction for the selective leaching is a simultaneous reaction of acid decompn. and redn. of the slime. The reaction is controlled by the mass transport of some species through the soln. boundary layer between the **solid phase** and the bulk soln.

IT 1309-60-0P 7446-14-2P

RL: RCT (Reactant); PREP (Preparation); **RACT (Reactant or reagent)**

(leaching of, from scrap batteries by ferrous chloride soln.)

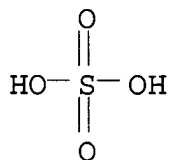
RN 1309-60-0 HCA

CN Lead oxide (PbO₂) (8CI, 9CI) (CA INDEX NAME)



RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

CC 54-2 (Extractive Metallurgy)

IT 1309-60-0P 7446-14-2P

RL: RCT (Reactant); PREP (Preparation); **RACT (Reactant or reagent)**

(leaching of, from scrap batteries by ferrous chloride soln.)

L57 ANSWER 13 OF 22 HCA COPYRIGHT 2005 ACS on STN

101:62481 Electrolysis and voltammetry of **solid phases**

. Rozhdestvenskaya, Z. B.; Smirnova, V. V. (Kaz. Gos. Univ., Alma-Ata, USSR). Izvestiya Vysshikh Uchebnykh Zavedenii, Khimiya i Khimicheskaya Tekhnologiya, 27(5), 550-5 (Russian) 1984. CODEN: IVUKAR. ISSN: 0579-2991.

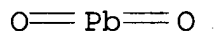
AB For a no. of monotypic sulfide minerals, a correlation is shown of the calcd. values of the Gibbs free energy (.DELTA.G) and the crystal lattice energy (U0) with exptl. found values of the decompn. potentials of minerals during their anodic oxidn. Exptl. data are presented on the potentials of a no. of Pb-contg. compds., as well as on the potentials of anodic oxidn. of certain rare metals in electrolytes of different compn.

IT 1309-60-0 1314-41-6 1317-36-8, reactions
7446-14-2

RL: RCT (Reactant); **RACT (Reactant or reagent)**
(oxidn.-redn. of, electrochem.)

RN 1309-60-0 HCA

CN Lead oxide (PbO2) (8CI, 9CI) (CA INDEX NAME)



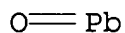
RN 1314-41-6 HCA

CN Lead oxide (Pb3O4) (8CI, 9CI) (CA INDEX NAME)

*** STRUCTURE DIAGRAM IS NOT AVAILABLE ***

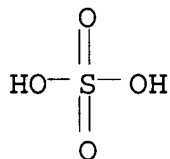
RN 1317-36-8 HCA

CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)



RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

CC 72-2 (Electrochemistry)
Section cross-reference(s): 54

ST ore treatment voltammetry electrolysis; electrolysis voltammetry
solid phase; sulfide mineral decompn potential;
lead compd decompn potential

IT Ore treatment
(electrolysis and voltammetry of **solid phases**
in)

IT Electrolysis
Voltammetry
(of **solid phases**)

IT Crystal lattice energy
Free energy
(of sulfide minerals, electrolysis and voltammetry of
solid phases in relation to)

IT 598-63-0 **1309-60-0 1314-41-6** 1314-87-0
1317-36-8, reactions **7446-14-2** 7758-95-4
12179-39-4 14476-15-4 14594-79-7
RL: RCT (Reactant); **RACT (Reactant or reagent)**
(oxidn.-redn. of, electrochem.)

L57 ANSWER 14 OF 22 HCA COPYRIGHT 2005 ACS on STN

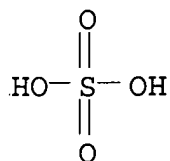
86:127994 X-ray diffraction study of the changes with heat of the
mixture copper sulfate pentahydrate/.alpha.-lead(II) oxide 1/1 M,
grain size <0.037 mm, already reacting at room temperature.
Garcia-Clavel, M. E.; Tejedor-Tejedor, M. I. (Dep. Quim. Anal., Fac.
Cienc., Madrid, Spain). Anales de Quimica (1968-1979), 72(4), 362-8
(Spanish) 1976. CODEN: ANQUBU. ISSN: 0365-4990.

AB Products from the **solid-state** room temp.
reaction of CuSO4.5H2O with .alpha.-PbO with particle sizes
<0.06 mm are calcined at up to 700.degree.. Chem. transformations
are studied by x-rays. Results indicate the following reactions
occur in various temp. ranges: 200-540.degree. Cu4SO4(OH)6 .fwdarw.
3H2O + CuSO4.3CuO (amorphous); 540-650.degree. CuSO4.3CuO .fwdarw.
CuSO4.CuO + 2CuO, 3PbSO4 + .alpha.-PbO .fwdarw. PbSO4.PbO + 2PbSO4,
CuSO4.CuO + 2CuO + PbSO4.PbO + 2PbSO4 .fwdarw. 4PbSO4 + 4CuO.

IT **7446-14-2**
RL: RCT (Reactant); **RACT (Reactant or reagent)**
(reaction of, in copper oxide-copper sulfate-lead oxide mixts.)

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

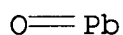
IT 1317-36-8, reactions

RL: RCT (Reactant); **RACT (Reactant or reagent)**

(reactions of, in mixts. with copper and lead oxides and sulfates)

RN 1317-36-8 HCA

CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)



CC 67-3 (Catalysis and Reaction Kinetics)

Section cross-reference(s): 73

IT 7446-14-2

RL: RCT (Reactant); **RACT (Reactant or reagent)**

(reaction of, in copper oxide-copper sulfate-lead oxide mixts.)

IT 1317-36-8, reactions

RL: RCT (Reactant); **RACT (Reactant or reagent)**

(reactions of, in mixts. with copper and lead oxides and sulfates)

L57 ANSWER 15 OF 22 HCA COPYRIGHT 2005 ACS on STN

86:96930 Thermodynamic study of the **solid** and liquid**phases** in the lead(II) oxide-lead(II) sulfate system.

Derriche, Zoubir; Perrot, Pierre (Lab. Thermochim. Metall., Univ. Sci. Tech. Lille, Villeneuve d'Ascq, Fr.). Revue de Chimie Minerale, 13(4), 310-23 (French) 1976. CODEN: RVCMA8. ISSN: 0035-1032.

AB Inside the Pb-S-O system, there are 8 monovariant equil., of which 5 are independent. The measurement of SO₂ pressure vs. temp. gives access to the free energy of formation of **PbSO₄** and **PbSO₄.cntdot.PbO**. The std. states are liq. Pb, gaseous S₂ and O₂. The free energies calcd. are: .DELTA.Gf0(**PbSO₄.cntdot.4PbO**) = -439.010 + 183.2T, .DELTA.Gf0(**PbSO₄.cntdot.2PbO**) = -332,730 + 136.5T, .DELTA.Gf0(**PbSO₄.cntdot.PbO**) = -284,950 + 119.1T, .DELTA.Gf0(**PbSO₄**) = -230,430 + 98.7T (cal.). The liq. solns. of **PbSO₄-PbO** present a neg.

deviation from ideality. Anal. expressions are proposed for the activity coeff. with respect to the mole fraction of **PbSO₄** in the mixt.: $\text{Log. gamma. PbSO}_4 = (1,934x-3,074) (1-x)^2$ and $\text{Log. gamma. PbO} = (1,934x-4,087)x^2$. The phase diagram of the system **PbSO₄-PbO** can then be calcd. Slight modifications are proposed to the previously accepted diagram.

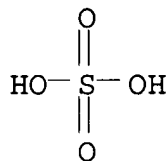
IT 7446-14-2

RL: PRP (Properties)

(free energy of formation and phase diagram with **lead oxide**)

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

IT 12036-76-9 12036-93-0

RL: PRP (Properties); FORM (Formation, nonpreparative)
(free energy of formation of)

RN 12036-76-9 HCA

CN Lead oxide sulfate (**Pb₂O(SO₄)**) (7CI, 8CI, 9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O	1	17778-80-2
O4S	1	14808-79-8
Pb	2	7439-92-1

RN 12036-93-0 HCA

CN Lead oxide sulfate (**Pb₃O₂(SO₄)**) (7CI, 8CI, 9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O	2	17778-80-2
O4S	1	14808-79-8
Pb	3	7439-92-1

IT 1317-36-8, properties

RL: PRP (Properties)

(systems, **lead sulfate-**)

RN 1317-36-8 HCA

CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)

O=Pb

CC 69-2 (Thermodynamics, Thermochemistry, and Thermal Properties)

Section cross-reference(s): 68

ST **lead oxide** sulfate thermodyn; free energy**lead oxide** sulfate

IT Free energy

(of formation, of **lead oxide** sulfate)

IT Activity

(of **lead oxide** and **lead sulfate**)

IT 7446-14-2

RL: PRP (Properties)

(free energy of formation and phase diagram with **lead oxide**)

IT 12036-76-9 12036-93-0 12065-90-6

RL: PRP (Properties); FORM (Formation, nonpreparative)

(free energy of formation of)

IT 1317-36-8, properties

RL: PRP (Properties)

(systems, **lead sulfate-**)

L57 ANSWER 16 OF 22 HCA COPYRIGHT 2005 ACS on STN

85:163355 Lead storage battery electrodes. Gabano, Jean P.; Jumel, Yves (Compagnie Europeenne d'Accumulateurs, Fr.). Fr. Demande FR 2278173 19760206, 6 pp. (French). CODEN: FRXXBL. APPLICATION: FR 1974-24165 19740711.

AB Thin cathodes for Pb-acid batteries are prepd. from a 83:17

Pb oxide-Pb sulfate paste,prepd. electrochem. from **Pb oxide** and H₂SO₄ (d.1.08), by drying at 40.degree., grinding, **sieving**, and by coating the **sieved** mixt. in a mold with molten Pb-6% Sb.

The capacity of a thus prepd. cathode (vol. 4.15 cm³, surface area 37.77 cm²) after 120 cycles of charging and discharging at 0.4 A in 2.29 hr was 244 A-hr/dm³. The resp. capacities of similarly prepd. 150 .times. 84 .times. 1 and 150 .times. 84 .times. 2 mm electrodes after 1st cycle were 296 and 414 A-hr/dm³. After 16th cycle, they were 252 and 335/A-hr/dm³.

IC H01M035-20

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

L57 ANSWER 17 OF 22 HCA COPYRIGHT 2005 ACS on STN

82:88443 Effects of technological parameters on changes in phase composition of **pastes** and positive electrodes of acid

storage **batteries**. Skoluda, Edmund; Olszanski, Stanislaw; Szczesniak, Barbara; Hendrysiak, Hanna; Tabat, Stanislaw (Cent. Lab. Akumulatorow Ogniow, Poznan, Pol.). Przemysl Chemiczny, 53(10), 624-7 (Polish) 1974. CODEN: PRCHAB. ISSN: 0033-2496.

- AB The effect of temp. (27-100.degree.) on the phase compn. of cathode **pastes** with different SO42- concn. was studied by x-ray anal. and electronic microscopy. During the **paste** prepn., 6 **solid phases** in equil. with the liq. phase are obtained. The content of **4PbO.PbSO4** [12065-90-6] increased with increasing temp., the phase was the main phase of the obtained **paste** at 85-100.degree.. Increased concn. of SO42- in the **pastes** caused a decrease in the .alpha.-PbO2 [**1309-60-0**] (orthorhombic) content and an increase in the .beta.-PbO2 (tetragonal) content in the formed plates. Modification .beta. has a higher capacitance than modification .alpha..

IT **1309-60-0**

RL: USES (Uses)

(in **battery** cathodes, effect of sulfate ion concn. and temp. on)

RN 1309-60-0 HCA

CN Lead oxide (PbO2) (8CI, 9CI) (CA INDEX NAME)



CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 68

ST cathode lead acid **battery**

IT Cathodes

(**battery**, lead-acid, phase compn. of, effect of sulfate ion concn. and temp. on)

IT **1309-60-0** 12065-90-6

RL: USES (Uses)

(in **battery** cathodes, effect of sulfate ion concn. and temp. on)

L57 ANSWER 18 OF 22 HCA COPYRIGHT 2005 ACS on STN

79:84180 Hydrothermal synthesis of basic **lead sulfates**

. Kuzel, H. J. (Mineral Inst., Univ. Erlangen-Nuernberg, Erlangen, Fed. Rep. Ger.). Neues Jahrbuch fuer Mineralogie, Monatshefte (3), 110-16 (German) 1973. CODEN: NJMMAW. ISSN: 0028-3649.

- AB The system **PbO-PbSO4-H2O** was studied by hydrothermal methods up to 660.degree. and 2500 kg/cm2. The only **solid phases** found were the basic **lead-sulfates 4PbO.PbSO4, PbO.PbSO4** and **3PbO.PbSO4.H2O**. Single crystals of the compounds **4PbO.PbSO4** and **PbO.PbSO4** of several mm length were grown in 0.2 N NaOH

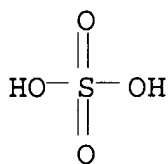
solutions at temperatures of 350-410.degree. and at a pressure of 400 kg/cm2. Spontaneous nucleation and crystal growth of 3PbO.
PbSO4.H2O at the colder parts of the autoclave were obsd. at 2200 kg/cm2 and <140.degree.. Single crystal x-ray investigations of 3PbO.**PbSO4.H2O** led to the triclinic space group P1 or P1.hivin. and cell parameters: a0 10.30 .+- . 0.01, b0 6.37 .+- . 0.01, c0 7.45 .+- . 0.01 .ANG., .alpha. 87.2 .+- . 0.1.degree., .beta. 75.0 .+- . 0.1 and .gamma. 79.2 .+- . 0.1.degree..

IT 7446-14-2

RL: PRP (Properties)
 (system, **lead oxide**-water-)

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



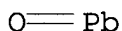
● Pb(II)

IT 1317-36-8, properties

RL: PRP (Properties)
 (system, **lead sulfate**-water-)

RN 1317-36-8 HCA

CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)



CC 70-1 (Crystallization and Crystal Structure)

Section cross-reference(s): 68

ST growth **lead oxide** sulfate hydrate; structure

lead oxide sulfate hydrate

IT Crystal growth

Crystal structure

(of **lead oxide** sulfate hydrate)

IT 7446-14-2

RL: PRP (Properties)
 (system, **lead oxide**-water-)

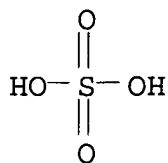
IT 1317-36-8, properties

RL: PRP (Properties)
 (system, **lead sulfate**-water-)

- 68:52191 Physical-chemical principles of lead sulfide roasting. Melin, Albert; Winterhager, Helmut (Tech. Hochsch., Aachen, Fed. Rep. Ger.). Zeitschrift fuer Erzbergbau und Metallhuettenwesen, 20(12), 561-9 (German) 1967. CODEN: ZEMHAC. ISSN: 0372-848X.
- AB The literature is reviewed in detail. The equil. phase, with po = 0.01-0.1 atm. is **PbSO4** up to .apprx.900.degree., and above this, basic **Pb sulfates**. As PbS is roasted, the intermediate products are basic sulfates and possibly Pb. Expts. on roasting briquetted PbS 75-175 hrs. at 760-90.degree. in air confirm the above. X-ray diffraction data show **PbSO4** in the outer layers and **PbO.PbSO4**, **2PbO.PbSO4**, and **4PbO.PbSO4** in succession toward the center. Thermobalance expts. show a wt. gain up to 800.degree., but wt. loss at >800.degree.. The loss is caused, not by a new reaction mechanism, but by vaporization of PbS. Const. temp. and const. heating rate studies of the reaction between PbS and **PbSO4** in air were made. Av. activation energies were detd. as follows: PbS + **PbSO4** .fwdarw. **PbO.PbSO4**, 43 kcal./mole; PbS + **PbO.PbSO4** .fwdarw. **2PbO.PbSO4**, 56 kcal./mole; and 2 PbS + **2PbO.PbSO4** .fwdarw. **4PbO.PbSO4**, 45 kcal./mole. These results are consistent with a **solid-state** diffusion mechanism for these reactions. Structure similarities of PbS and **PbSO4** along certain crystal planes suggest a mechanism for the conversion of PbS to **PbSO4**. The formation of **PbO** during the roasting of pure PbS occurs only above the m.p. (>1100.degree.), but the presence of high temps., CaO, and SiO2 in practice allows formation of some **PbO**. 22 references.
- IT 1317-36-8P, preparation 7446-14-2P
12036-76-9P 12036-93-0P
RL: FORM (Formation, nonpreparative); PREP (Preparation)
(formation of, in roasting of lead sulfide (PbS))
- RN 1317-36-8 HCA
- CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)

O=Pb

- RN 7446-14-2 HCA
- CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

RN 12036-76-9 HCA

CN Lead oxide sulfate (Pb2O(SO4)) (7CI, 8CI, 9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	1	17778-80-2
O4S	1	14808-79-8
Pb	2	7439-92-1

RN 12036-93-0 HCA

CN Lead oxide sulfate (Pb3O2(SO4)) (7CI, 8CI, 9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	2	17778-80-2
O4S	1	14808-79-8
Pb	3	7439-92-1

CC 54 (Extractive Metallurgy)

IT 1317-36-8P, preparation 7446-14-2P

12036-76-9P 12036-93-0P 12065-90-6P

RL: FORM (Formation, nonpreparative); PREP (Preparation)
(formation of, in roasting of lead sulfide (PbS))

L57 ANSWER 20 OF 22 HCA COPYRIGHT 2005 ACS on STN

58:12801 Original Reference No. 58:2112a-c The thermal decomposition of sulfides and sulfates of bivalent cations in air: Cu, Zn, Cd, Hg, Sn, and Pb compounds. Hoschek, Gert (Tech. Hochschule, Graz, Austria). Monatshefte fuer Chemie, 93, 826-40 (Unavailable) 1962. CODEN: MOCMB7. ISSN: 0026-9247.

AB The change of the sulfides and sulfates of Cu, Zn, Cd, Hg, Sn, and Pb in air, in the **solid phase**, at 100-1100.degree. are: CuS .fwdarw. CuSO4 .fwdarw. CuO.CuSO4 .fwdarw. CuO; ZnS .fwdarw. ZnSO4 .fwdarw. 2ZnO.3ZnSO4 .fwdarw. ZnO; CdScu. .fwdarw. CdShex. .fwdarw. .alpha.-CdSO4 .fwdarw. 2CdO.-CdSO4

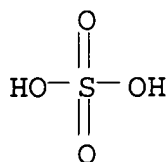
.fwdarw. CdO, and .alpha.-CdSO₄ .fwdarw. .beta.-CdSO₄; HgShex.
.fwdarw. HgScu.; HgSO₄ .fwdarw. HgO.HgSO₄ .fwdarw. 2HgO.HgSO₄, and
HgSO₄ .fwdarw. Hg₂SO₄; SnS .fwdarw. SnSO₄ .fwdarw. SnO₂, and SnS
.fwdarw. SnS₂ + SnO₂; PbS .fwdarw. Pb-SO₄ .fwdarw. **PbO**.
PbSO₄ .fwdarw. 2PbO.**PbSO₄** .fwdarw. **4PbO**.
PbSO₄ .fwdarw. **PbO**. The structures of some of the
compds. and the phase diagrams of the systems metal-S-O are studied.

IT 7446-14-2, **Lead sulfate, PbSO₄**

(decompn. by heat)

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

CC 14 (Inorganic Chemicals and Reactions)

IT 1306-23-6, Cadmium sulfide 1314-87-0, Lead sulfide 1314-95-0,
Tin sulfide, SnS 1317-40-4, Copper sulfide, CuS 1344-48-5,
Mercury sulfide, HgS **7446-14-2, Lead**
sulfate, PbSO₄ 7758-98-7, Copper sulfate
7783-35-9, Mercury sulfate, HgSO₄ 10124-36-4, Cadmium sulfate
(decompn. by heat)

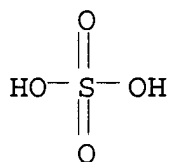
L57 ANSWER 21 OF 22 HCA COPYRIGHT 2005 ACS on STN

46:4916 Original Reference No. 46:845i,846f-i Formation of
engine-deposit compounds by **solid-state**
reactions. Lamb, Frances W.; Niebylski, Leonard M. (Ethyl Corp.,
Detroit, MI). Anal. Chem., 23, 1388-97 (Unavailable) 1951. CODEN:
ANCHAM. ISSN: 0003-2700.

AB A study of numerous **solid-state** addn. and
replacement reactions between inorg. Pb salts was undertaken. All
the compds. commonly found in engine deposits can be produced as a
result of addn. reactions in the **solid state**
between various Pb salts and **PbO** at temps. well below
their m.ps. The resulting or surviving products of the
solid-state reactions are detd. only by the temp.
and the mol. ratio of the **PbO** to the normal Pb salts. A
one-to-one correspondence is shown between the temps. which produce
specific compds. on a thermal plug in an engine and the "reaction"
temps. required for prodn. of the same compds. by **solid-**
state reaction. In a **solid-state**

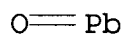
replacement reaction between a basic Pb salt and a normal Pb salt, the reaction temp. is detd. by that required for the **solid-state** addn. of the released **PbO** and the normal Pb salts. The cryst. form of **PbO.PbCl.Br**, produced from the **solid-state** reactions between **2PbO.PbBr₂** and **PbCl₂** and between **2PbO.PbCl₂** and **PbBr₂**, depends upon the parent structure of the monobasic Pb halide formed by the initial addn. reaction between released **PbO** and the original normal Pb halide. Examples are described of increased activity due to the ability of metastable yellow **PbO** to form a reactive red **PbO** when heated in the presence of a second compd. with which **PbO** will readily form an addn. product. The interplanar spacing values are given for the major reflections of the following inorg. Pb compds. commonly occurring in engine deposits: **PbO.PbBr₂** (2 forms), **PbO.PbCl₂**, **PbO.PbCl.Br** (2 forms), **2PbO.PbBr₂**, **2PbO.PbCl₂**, **2PbO.PbCl.Br**, **PbO.PbSO₄**, and **4PbO.PbSO₄**.

IT 7446-14-2, **Lead sulfate**
 (engine deposits of basic, and their structure)
 RN 7446-14-2 HCA
 CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

IT 1317-36-8, **Lead oxide, PbO**
 (reaction of, with Pb salts, engine deposits and)
 RN 1317-36-8 HCA
 CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)



CC 6 (Inorganic Chemistry)
 IT 7446-14-2, **Lead sulfate**
 (engine deposits of basic, and their structure)
 IT 1317-36-8, **Lead oxide, PbO**
 (reaction of, with Pb salts, engine deposits and)
 IT 7439-92-1, **Lead**
 (salts, reaction of, in **solid state**, engine deposits and)

L57 ANSWER 22 OF 22 HCA COPYRIGHT 2005 ACS on STN

1:11412 Original Reference No. 1:2769i,2770a-e On the Chemical Equilibria of the Reactions between Lead Sulphide and its Oxidation Products. Schenck, R.; Rassbach, W. (Aachen). Ber., 40, 2185-2201 (Unavailable) 1907.

AB By application of the Phase Rule to the system of the 3 components, lead, sulphur and oxygen, it follows that for one degree of freedom, four phases can exist. The pressure being determined by the gaseous phase SO₂, the presence of 3 **solid phases** is necessary at a given temperature, to determine equilibrium. These may be: (1) Pb, PbS, **PbSO₄**; (2) Pb, PbS, **PbO**; (3) PbS, **PbSO₄**, **PbO**, and (4) Pb, **PbSO₄**, **PbO**, respectively and correspond to the equilibria of the reactions: (1) $\text{PbS} + \text{PbSO}_4 \rightleftharpoons 2\text{Pb} + 2\text{SO}_2$. (2). $\text{PbS} + 2\text{PbO} \rightleftharpoons 3\text{Pb} + \text{SO}_2$. (3). $\text{PbS} + 3\text{PbSO}_4 \rightleftharpoons 4\text{PbO} + 4\text{SO}_2$. (4). $\text{Pb} + \text{PbSO}_4 \rightleftharpoons 2\text{Pb} + \text{SO}_2$. Experimentally, three of the solid materials were placed in a porcelain tube which could be inserted in a furnace. After evacuating or filling with SO₂, the pressures were read in each case until they became constant. No means were adopted for keeping the **solid** (or fused) **phases** stirred, which, since layers sometimes formed, may have caused a false equilibrium to appear in many cases in consequence of slowness of diffusion. Actually only the equilibria represented by reactions 1 and 2 could be realized at pressures not exceeding 1 atm. For reaction 1, the same pressure was quickly attained from whichever direction it was approached. For reaction 2, a different equilibrium pressure was obtained according as approached from above or below and this is supposed by the authors to be occasioned either by the power of **PbSO₄** (formed under excess pressure of SO₂) and **PbO** to form solid solutions, or by the ability of PbS to dissolve in Pb at high temperatures. Finally the different fields of the temperature diagram are considered with respect to the **solid phases** which are capable of existence. From the equilibrium curve for the system Pb, PbS, **PbSO₄**, the heat of the reaction 1 is calculated.

CC 1 (Apparatus)

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L58 ANSWER 1 OF 23 HCA COPYRIGHT 2005 ACS on STN

142:300836 Processes taking place in the paste of lead-acid battery plates during soaking prior to formation and their influence on battery performance. Dimitrov, M.; Pavlov, D.; Rogachev, T.; Matrakova, M.; Bogdanova, L. (Central Laboratory of Electrochemical Power Sources, Bulgarian Academy of Sciences, Sofia, 1113, Bulg.). Journal of Power Sources, 140(1), 168-180 (English) 2005. CODEN:

JPSODZ. ISSN: 0378-7753. Publisher: Elsevier B.V..

AB Soaking is performed in the prodn. of lead-acid battery plates. Cured plates are soaked in a soln. on open circuit for 1-4 h and after that the formation process starts. During soaking the cured paste undergoes partial sulfation. The changes in chem. and phase compn. as well as the structure of the paste and the crystal morphol. of plates prepd. with 3BS pastes and soaked in 1.06 or 1.25 sp. gr. H₂SO₄ soln. were studied. During soaking the **lead oxides** and **basic lead sulfates** in the paste are hydrated and then sulfated forming 1BS and **PbSO₄**. The content of these phases decreases in the interior of the plates. This produced a **heterogeneous** structure and compn. of the paste. The sulfation of the corrosion layer was also studied. Batteries with plates prepd. with 3BS paste and PbSnCa grids have considerably longer cycle life, if soaked and formed in 1.06 sp. gr. H₂SO₄ as compared to those soaked and formed in 1.25 sp. gr. H₂SO₄.

IT **1317-36-8, Lead oxide (PbO),**
uses **12202-17-4, Tribasic lead sulfate**
RL: DEV (Device component use); USES (Uses)
(in soaking of electrode pastes for lead-acid battery plates and its influence on battery performance)

RN 1317-36-8 HCA

CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)

O=Pb

RN 12202-17-4 HCA

CN Lead oxide sulfate (Pb₄O₃(SO₄)) (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

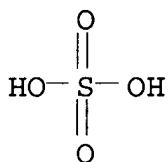
Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
O4S	1	14808-79-8
Pb	4	7439-92-1

IT **7446-14-2, Lead sulfate (PbSO₄)**

RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(in soaking of electrode pastes for lead-acid battery plates and its influence on battery performance)

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- IT 1317-36-8, **Lead oxide (PbO)**,
uses 7439-92-1, Lead, uses 12202-17-4, Tribasic
lead sulfate
RL: DEV (Device component use); USES (Uses)
(in soaking of electrode pastes for lead-acid battery plates and
its influence on battery performance)
- IT 7446-14-2, **Lead sulfate (PbSO₄)**
) 63653-42-9, Basic **lead sulfate**
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(in soaking of electrode pastes for lead-acid battery plates and
its influence on battery performance)
- L58 ANSWER 2 OF 23 HCA COPYRIGHT 2005 ACS on STN
- 142:9219 Additive for producing the positive active material for
lead-acid storage **batteries**, a method for its production,
and its use. Klein, Ian; Nitsche, Werner (Penox GmbH, Germany).
U.S. Pat. Appl. Publ. US 2004234852 A1 20041125, 5 pp.,
Cont.-in-part of U.S. Ser. No. 406,481. (English). CODEN: USXXCO.
APPLICATION: US 2003-746885 20031223. PRIORITY: DE 2002-10261049
20021224; DE 2003-10309842 20030306; US 2003-406481 20030403.
- AB Described is an additive for producing the pos. active material for
lead-acid storage **batteries** from finely divided tetrabasic
lead sulfate. The additive contains a tetrabasic lead sulfate of an
av. particle size smaller than .apprx.3 .mu.m as well as 0.01 - 10
wt.% of finely divided silicic acid for preventing an agglomeration
of the particles of the tetrabasic lead sulfate. During maturation,
this additive ensures the formation of the structure of a tetrabasic
lead sulfate crystal with a very narrow bandwidth of crystal sizes
and a very homogeneous distribution. In a subsequent electrochem.
formation to lead oxide, this leads to particularly efficient
lead-acid storage **batteries**. Also, the invention relates
to a method of making the additive according to the invention as
well as its advantageous use in the pos. material for the maturation
and drying of singled and not singled plates in the prodn. of
lead-acid storage **batteries**.
- IT 1317-36-8, Lead oxide, uses 7446-14-2, Lead

sulfate

RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); RCT (Reactant); PROC (Process); **RACT (Reactant or reagent)**; USES (Uses)

(additive for producing pos. active material for lead-acid storage **batteries**, method for its prodn., and its use)

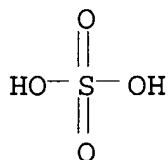
RN 1317-36-8 HCA

CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)

O=Pb

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

IC ICM H01M004-58

INCL 429227000; 252182100

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 48, 75

ST lead acid storage **battery** plate electrode seeded crystn
silica

IT **Battery** anodes

Grain size

Suspensions

(additive for producing pos. active material for lead-acid storage **batteries**, method for its prodn., and its use)

IT Plates

(electrodes; additive for producing pos. active material for lead-acid storage **batteries**, method for its prodn., and its use)

IT Secondary **batteries**

(lead-acid; additive for producing pos. active material for lead-acid storage **batteries**, method for its prodn., and its use)

IT Drying

(of plate electrodes; additive for producing pos. active material for lead-acid storage **batteries**, method for its prodn., and its use)

- IT Surface area
(of silicic acid, <300 m²/g; additive for producing pos. active material for lead-acid storage **batteries**, method for its prodn., and its use)
- IT Particle size
(of tetrabasic lead sulfate additive, < 3 .mu.m, and silicic acid 10-120 nm; additive for producing pos. active material for lead-acid storage **batteries**, method for its prodn., and its use)
- IT Ball milling
(of tetrabasic lead sulfate; additive for producing pos. active material for lead-acid storage **batteries**, method for its prodn., and its use)
- IT Crystallization
(seeded; additive for producing pos. active material for lead-acid storage **batteries**, method for its prodn., and its use)
- IT Drying
(spray, of milled tetrabasic lead sulfate; additive for producing pos. active material for lead-acid storage **batteries**, method for its prodn., and its use)
- IT 52732-72-6, Tetrabasic lead sulfate
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); PROC (Process); USES (Uses)
(additive for producing pos. active material for lead-acid storage **batteries**, method for its prodn., and its use)
- IT 1317-36-8, Lead oxide, uses 7446-14-2, Lead sulfate
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); RCT (Reactant); PROC (Process); **RACT (Reactant or reagent)**; USES (Uses)
(additive for producing pos. active material for lead-acid storage **batteries**, method for its prodn., and its use)
- IT 1343-98-2, Silicic acid
RL: DEV (Device component use); MOA (Modifier or additive use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(hydrophobic, hydrophilic, or pyrogenic, to prevent agglomeration; additive for producing pos. active material for lead-acid storage **batteries**, method for its prodn., and its use)

L58 ANSWER-3 OF 23 HCA COPYRIGHT 2005 ACS on STN

138:340895 Strap grid tubular plate-a new positive plate for lead-acid **batteries**. Processes of residual sulphation of the positive plate. Pavlov, D.; Papazov, G.; Monahov, B. (Central Laboratory of Electrochemical Power Sources, Bulgarian Academy of Sciences, Sofia, 1113, Bulg.). Journal of Power Sources, 113(2), 255-270 (English)

2003. CODEN: JPSODZ. ISSN: 0378-7753. Publisher: Elsevier Science B.V..

AB For almost a century now the tubular plate design has been based on cylindrical tubes and spines. The contact surface between the pos. active mass (PAM) and the spine is small, which results in high polarization of the plate at high discharge currents and low power output of the cell. In an attempt to eliminate these disadvantages, the shape of the tubes has been changed to flattened elliptic and the spines have been replaced by strap grids. The thickness of this new type of tubular plate, strap grid tubular plate (SGTP), is between 3 and 5 mm. **Batteries** with tubular plates of the new design (SGTP **batteries**) can be used in elec. vehicle (EV) and photovoltaic (PV) system applications. This paper presents results of SGTP **battery** tests according to the European stds. for EV, hybrid elec. vehicle (HEV), and photovoltaic (PV) system **batteries**. SGTP **batteries** have a cycle life of 1000 ECE-15-EV cycles, 6000 ECE-HEV cycles and more than eight gross PV cycles. The optimum **battery** charge algorithm for VRLA **batteries** with strap grid tubular plates has been established and the mechanism of disintegration of the pos. active mass has been disclosed. The following phenomena are responsible for the decline in capacity of the pos. plates. First, when the PAM is built up of globules adhering closely to each other, a strong skeleton with thick aggregates (branches) with a membrane surface is formed. The surface layer of the branches impedes the access of H₂O and H₂SO₄ to their interior thus reducing the utilization of the PAM. Besides, internal stresses are created in the aggregates, which cause them to crack. Secondly, when the PAM is built up of individual agglomerates with micropores in between, a porous mass with large surface is formed. The tubes keep the aggregates together and prolong the cycle life of the **battery**. During discharge, the contacts between the aggregates weaken and the capacity declines. Third, during discharge, the H₂SO₄ concn. in the pores of the plate inner layers (close to the straps) increases. In concd. H₂SO₄ soln. the soly. of PbSO₄ crystals decreases. This slows down the rate of oxidn. of PbSO₄ to PbO₂. Some parts of the PbSO₄ crystals in the PAM of the charged plate remain unoxidized (residual sulfation). Thus, the capacity of the plate is lower. Strap corrosion is the phenomenon that may limit the cycle life of SGT plates.

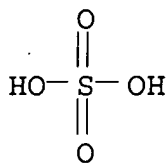
IT 7446-14-2, Lead sulfate PbSO₄

RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); **RACT (Reactant or reagent)**

(oxidn. of, to lead oxide; residual sulfation process of strap grid tubular plates as new pos. plate for lead-acid **batteries**)

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

- IT 1309-60-0, Lead oxide PbO₂
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); **RACT (Reactant or reagent)**
 (oxidn. product, from lead sulfate; residual sulfation process of strap grid tubular plates as new pos. plate for lead-acid **batteries**)
- RN 1309-60-0 HCA
 CN Lead oxide (PbO₂) (8CI, 9CI) (CA INDEX NAME)
- O=Pb=O
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST strap grid tubular plate lead acid **battery** electrode
 IT Secondary **batteries**
 (lead-acid; residual sulfation process of strap grid tubular plates as new pos. plate for lead-acid **batteries**)
- IT Oxidation
 (of lead sulfate to lead oxide; residual sulfation process of strap grid tubular plates as new pos. plate for lead-acid **batteries**)
- IT **Battery** cathodes
 Electric vehicles
 Sulfidation
 (residual sulfation process of strap grid tubular plates as new pos. plate for lead-acid **batteries**)
- IT 62304-24-9
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); PROC (Process); USES (Uses)
 (acid **battery** plates; residual sulfation process of strap grid tubular plates as new pos. plate for lead-acid **batteries**)
- IT 7664-93-9, Sulfuric acid, reactions
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)

(**battery** electrolyte; residual sulfation process of strap grid tubular plates as new pos. plate for lead-acid **batteries**)

IT 7446-14-2, Lead sulfate PbSO_4

RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); **RACT (Reactant or reagent)**

(oxidn. of, to lead oxide; residual sulfation process of strap grid tubular plates as new pos. plate for lead-acid **batteries**)

IT 1309-60-0, Lead oxide PbO_2

RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); **RACT (Reactant or reagent)**

(oxidn. product, from lead sulfate; residual sulfation process of strap grid tubular plates as new pos. plate for lead-acid **batteries**)

L58 ANSWER 4 OF 23 HCA COPYRIGHT 2005 ACS on STN

137:269648 Analysis of discharge/charge reaction of PbO_2 thin film electrode by using electrochemical QCM technique. Taguchi, Masami; Sugita, Hiroshi (Department of Materials Science and Engineering, Faculty of Engineering and Resource Science, Akita University, Akita, 010-8502, Japan). Nippon Kinzoku Gakkaishi, 66(6), 670-675 (Japanese) 2002. CODEN: NIKGAV. ISSN: 0021-4876. Publisher: Nippon Kinzoku Gakkai.

AB To investigate the discharge/charge process of active materials for the pos. electrode in lead-acid **batteries**, a PbO_2 thin film was deposited on a piezoelec. quartz crystal by reactive sputtering, and then in-situ observations of the wt. change of the PbO_2 electrode were carried out by using the electrochem. quartz crystal microbalance (QCM) technique. The PbO_2 thin film produced by sputtering a Pb target in an oxygen plasma was identified as a mixt. of .alpha.- PbO_2 and .beta.- PbO_2 . The discharge process by a low current suggested that the reaction of PbO_2 .fwdarw. PbSO_4 proceeded first, and then the reactions such as PbO_2 .fwdarw. PbO , PbO_2 .fwdarw. Pb and PbSO_4 .fwdarw. Pb occurred one after another. During the potentiostatic discharge/charge process, most of the discharge reaction of PbO_2 .fwdarw. PbSO_4 was completed at the beginning of the process, while the charge reaction of PbSO_4 .fwdarw. PbO_2 slowly proceeded. The conversion ratio of the PbSO_4 back to the original PbO_2 during charging was estd. to be only .apprx.52% based on the wt. change. Right after the start of both the discharge and charge, the wt. decreases in sharp intervals as the result of the dissoln.-pptn. mechanism were confirmed by the electrochem. QCM technique. Repetition of the discharge/charge increased the ratio of .beta.- PbO_2 to .alpha.- PbO_2 in the charged product. Moreover, there were PbSO_4 crystals of various sizes on the PbO_2 surface after discharge, and the small crystals in the

lower part dissolved earlier than the large ones to be transformed to PbO₂ particles .apprx.30 nm diam. during the charge. Refinement of the PbSO₄ crystals during discharge is an important factor to improve the charging of the active materials for the pos. electrode.

IT 1309-60-0, Lead dioxide 7446-14-2, Lead sulfate

RL: RCT (Reactant); **RACT (Reactant or reagent)**

(anal. of discharge/charge reaction of PbO₂ thin film electrode in lead-acid **batteries**)

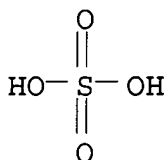
RN 1309-60-0 HCA

CN Lead oxide (PbO₂) (8CI, 9CI) (CA INDEX NAME)



RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

CC 72-2 (Electrochemistry)

ST lead dioxide electrode charge discharge reaction **battery**

IT **Battery** electrodes

Electrode reaction

(anal. of discharge/charge reaction of PbO₂ thin film electrode in lead-acid **batteries**)

IT Secondary **batteries**

(lead-acid; anal. of discharge/charge reaction of PbO₂ thin film electrode in lead-acid **batteries**)

IT 1309-60-0, Lead dioxide 7446-14-2, Lead sulfate

RL: RCT (Reactant); **RACT (Reactant or reagent)**

(anal. of discharge/charge reaction of PbO₂ thin film electrode in lead-acid **batteries**)

L58 ANSWER 5 OF 23 HCA COPYRIGHT 2005 ACS on STN

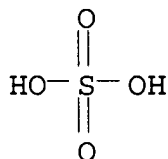
137:116019 Phenomena that limit the capacity of the positive lead acid **battery** plates I. The charge potential transient as an indicator of positive plate state of charge and state of health. Pavlov, D.; Petkova, G. (Central Laboratory of Electrochemical Power Sources, Bulgarian Academy of Sciences, Sofia, 1113, Bulg.). Journal of the Electrochemical Society, 149(5), A644-A653 (English)

2002. CODEN: JESOAN. ISSN: 0013-4651. Publisher: Electrochemical Society.

- AB The capacity of the pos. plate of the lead-acid **battery** is detd. by the no. of the active centers in pos. active material (PAM) where the reaction $\text{PbO}_2 \rightarrow \text{PbSO}_4$ proceeds and by the resistance of the interface corrosion layer (CL) + AMCL (thin PAM layer interconnecting the PAM and the CL). It was established that the no. of the active centers is high if the pos. plate discharge is performed with low current and if the charge (at the initial period) is performed with high current. During discharge the active centers from the outer layer of the plate are exhausted and the reaction of the PbO_2 redn. approaches the inner part of the plate near the interface and the interface itself. If the pH of the pore soln. is low the redn. of the PbO_2 proceeds to PbSO_4 . At the subsequent charge with sufficiently high current a max. appears on the potential transient. When the H_2SO_4 flux to the interface is impeded, the pH of the soln. in the pores in the interface is high and the redn. of the PbO_2 proceeds to PbO_n ($1 < n < 1.5$). As the PbO_n has high elec. resistance, during the subsequent charge with high current a peak appears at the beginning of the potential transient. Its height depends on the resistance of the interface. On the basis of the appearance of a max. or a peak the state of change and the state of health of the pos. plate can be detd.
- IT **1309-60-0**, Lead dioxide **7446-14-2**, Lead sulfate
 RL: CPS (Chemical process); DEV (Device component use); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); **RACT (Reactant or reagent)**; USES (Uses)
 (charge potential transient as indicator of pos. plate state of charge and state of health)
- RN 1309-60-0 HCA
 CN Lead oxide (PbO_2) (8CI, 9CI) (CA INDEX NAME)



- RN 7446-14-2 HCA
 CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

- CC 72-2 (Electrochemistry)
Section cross-reference(s): 52, 78
- ST lead acid **battery** plate capacitance limit charge potential transient
- IT Electric capacitance
Electric charge
Electric potential
Secondary **batteries**
(charge potential transient as indicator of pos. plate state of charge and state of health)
- IT Reduction, electrochemical
(of PbO₂ in lead **battery** pos. plate during discharge cycle)
- IT Corrosion
(resistance; of interface corrosion layer and pos. active material in lead **battery**)
- IT **1309-60-0**, Lead dioxide **7446-14-2**, Lead sulfate
RL: CPS (Chemical process); DEV (Device component use); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); **RACT (Reactant or reagent)**; USES (Uses)
(charge potential transient as indicator of pos. plate state of charge and state of health)

L58 ANSWER 6 OF 23 HCA COPYRIGHT 2005 ACS on STN

136:204408 Self-modeling mixture analysis of Raman micro-spectrometric investigations of dust emitted by lead and zinc smelters.

Batonneau, Yann; Laureyns, Jacky; Merlin, Jean-Claude; Bremard, Claude (Laboratoire de Spectrochimie Infrarouge et Raman, UMR-CNRS 8516, Universite des Sciences et Technologies de Lille, Villeneuve d'Ascq, F-59655, Fr.). Analytica Chimica Acta, 446(1-2), 23-37 (English) 2001. CODEN: ACACAM. ISSN: 0003-2670. Publisher: Elsevier Science B.V..

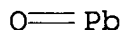
AB The application of simple-to-use interactive self-modeling mixt. anal. (SIMPLISMA) is reported to analyze huge Raman image data of dust samples collected near Pb and Zn smelters. Raman data were collected using a Raman microprobe and automated mapping stage at 1 .mu.m step-size over, at most, 80 .times. 70 .mu.m sample areas for each expt. Numerous significant pure spectra were extd. using the SIMPLISMA method. Results provide the no. of major and minor chem. species. Conc'n. maps of resolved components demonstrated the **heterogeneity** of individual particles at a 1-.mu.m spatial resoln. A discussion addresses the anal. aspects of SIMPLISMA and the relative merits and drawbacks of the method vs. conventional anal. from actual Raman image data.

IT **1317-36-8**, Lead oxide, occurrence
7446-14-2, Lead sulfate
RL: OCU (Occurrence, unclassified); POL (Pollutant); OCCU (Occurrence)
(particulate; interactive self-modeling mixt. anal. of Raman

micro-spectrometric data of flue dust emitted by lead and zinc smelters)

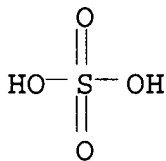
RN 1317-36-8 HCA

CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)



RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

CC 59-2 (Air Pollution and Industrial Hygiene)

Section cross-reference(s): 54, 56

IT 1309-37-1, Iron oxide (Fe₂O₃), occurrence 1314-98-3, Zinc sulfide, occurrence 1317-36-8, Lead oxide,

occurrence 1317-61-9, Iron oxide (Fe₃O₄), occurrence

7446-14-2, Lead sulfate 7778-18-9,

Calcium sulfate 12068-85-8, Iron sulfide (FeS₂)

RL: OCU (Occurrence, unclassified); POL (Pollutant); OCCU (Occurrence)

(particulate; interactive self-modeling mixt. anal. of Raman micro-spectrometric data of flue dust emitted by lead and zinc smelters)

L58 ANSWER 7 OF 23 HCA COPYRIGHT 2005 ACS on STN

136:58079 Prediction of gaseous pollutants and heavy metals during fluidized bed incineration of dye sludge. Jang, Jeong-Gook; Kim, Woo-Hyun; Kim, Mi-Ran; Chun, Hai-Soo; Lee, Jea-Keun (Dept. of Environ. Eng., Dongseo University, Pusan, 617-716, S. Korea). Korean Journal of Chemical Engineering, 18(4), 506-511 (English) 2001. CODEN: KJCHE6. ISSN: 0256-1115. Publisher: Korean Institute of Chemical Engineers.

AB This research provides an equil. model for predicting both the emission of gaseous pollutants and the fate of heavy metals during incineration of biol. treated dye sludge in a bench-scale fluidized-bed incinerator. Major gaseous pollutants and hazardous trace heavy metals have been also measured under various operating conditions. The predicted values, which were derived by using a

thermodn. equil. model, can be used to det. the optimum operating parameters and the risk assocd. with hazardous waste incineration by means of verifying exptl. data. However, prediction of NOx emission using a thermodyn. equil. model during incineration of the waste was not simple. The reason is that the variation of NOx emission during waste incineration was affected by the various operating parameters, such as air-fuel ratio (λ), primary air factor (λ_1/λ), combustor geometry, method of heat release, and preheating of combustion air. According to the distributions of Cr and Pb simulated by the equil. model, all of the Cr in the feed was retained in the ash as the solid phase of Cr₂O₃. However, most Pb was retained in the ash during incineration as the solid phase of PbSO₄, or heterogeneously deposited onto the fly ash as PbO(g) when the combustion gas becomes cool.

IT 1317-36-8, Lead oxide (PbO),
formation (nonpreparative) 7446-14-2, Sulfuric acid,
lead(2+) salt (1:1)
RL: FMU (Formation, unclassified); POL (Pollutant); FORM (Formation,
nonpreparative); OCCU (Occurrence)
(formation of; prediction of gaseous pollutant emission and heavy
metal behavior and fate in fluidized-bed incineration of dye
sludge)

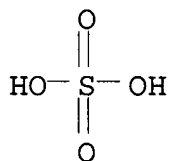
RN 1317-36-8 HCA

CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)

O=Pb

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

CC 60-5 (Waste Treatment and Disposal)

Section cross-reference(s): 59

IT 1308-38-9, Chromium oxide (Cr₂O₃), formation (nonpreparative)

1317-36-8, Lead oxide (PbO),

formation (nonpreparative) 7446-14-2, Sulfuric acid,

lead(2+) salt (1:1) 7758-95-4, Lead dichloride 13463-30-4, Lead
tetrachloride

RL: FMU (Formation, unclassified); POL (Pollutant); FORM (Formation, nonpreparative); OCCU (Occurrence)

(formation of; prediction of gaseous pollutant emission and heavy metal behavior and fate in fluidized-bed incineration of dye sludge)

L58 ANSWER 8 OF 23 HCA COPYRIGHT 2005 ACS on STN

134:283598 Thermodynamic analysis of redox processes involving lead sulfide. Sedykh, V. I.; Tupitsyn, A. A.; Bychinskii, V. A. (Kafedra Metall. Tsvetnykh Metallov, Irkutsk. Gos. Tekh. Univ., Irkutsk, Russia). Izvestiya Vysshikh Uchebnykh Zavedenii, Tsvetnaya Metallurgiya (1), 7-10 (Russian) 2001. CODEN: IVUTAK. ISSN: 0021-3438. Publisher: Moskovskii Gosudarstvennyi Institut Stali i Splavov.

AB Using the program complex .mchlt.Selector-S.mchgt., thermodyn. data show that oxidn. of lead sulfide by gaseous oxygen is a complex **heterogeneous** process controlled by temp. and oxygen content in the system. At very low oxygen concn. metallic lead and its mixt. with oxide and sulfides are the oxidn. products. At stoichiometric conditions and with excess oxygen the oxidn. of PbS generates **lead oxide**. **PbO.cntdot**. **PbSO4** and **2PbO.cntdot.PbSO4** play a significant role in the process of end-product formation. Carbon takes no direct part in the redox processes. The presence of CO2 in the gaseous phase shifts the beginning of a series of reactions to lower temps.

CC 54-2 (Extractive Metallurgy)

IT 12765-51-4P, **Lead oxide** sulfate

RL: PNU (Preparation, unclassified); PREP (Preparation)
(thermodyn. anal. by computer simulation of redox processes involving lead sulfide)

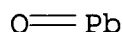
L58 ANSWER 9 OF 23 HCA COPYRIGHT 2005 ACS on STN

130:271130 Microchemical Investigations of Dust Emitted by a Lead Smelter. Sobanska, Sophie; Ricq, Natacha; Laboudigue, Agnes; Guillermo, Rene; Bremard, Claude; Laureyns, Jacky; Merlin, Jean Claude; Wignacourt, Jean Pierre (Departement Chimie et Environnement, Ecole des Mines de Douai, Douai, Fr.). Environmental Science and Technology, 33(9), 1334-1339 (English) 1999. CODEN: ESTHAG. ISSN: 0013-936X. Publisher: American Chemical Society.

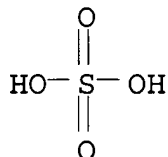
AB Dusts emitted by an important pyrometallurgical lead smelter have been sampled within the pipes of the grilling and furnace working units before and after the filtering systems, resp. Particle size distribution, elementary analyses, and X-ray powder diffraction anal. indicate PbS, **PbSO4**, **PbSO4.cntdot**. **PbO**, Pb, ZnS small particles less than 5 .mu.m in size to contribute mainly to the current atm. pollution. Although at least 90% of dust are retained on the filters, the amts. of the respirable smaller particles are significantly larger in the current emission.

The av. chem. speciation was found to be analogous for the dust samples collected before and after the filters. The SEM assocd. with energy-dispersive X-ray anal. and Raman microspectrometry established the morphol. and chem. compn. at the level of individual particles. A lot of minor compds. (.alpha.-**PbO**, .beta.-**PbO**, FeS₂, FeO, Fe₃O₄, .alpha.-Fe₂O₃, FeCO₃, CaSO₄.cntdot.2H₂O, CaCO₃, CdS, ...) were found as small **heterogeneous** individual particles (less than 5 .mu.m) in the **heterogeneous** particles of grilling dust. Among the homogeneous particles of furnace dust, amorphous C, .beta.-**PbO**, **PbO**.cntdot.PbCl₂, FeO, CdS, CdSO₄ were often detected as homogeneous mixts. with the major compds. within the particles.

IT 1317-36-8, **Lead oxide (PbO)**,
occurrence 7446-14-2, Sulfuric acid, lead(2+) salt (1:1)
RL: POL (Pollutant); OCCU (Occurrence)
(microchem. investigations of dust emitted by lead smelter)
RN 1317-36-8 HCA
CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)



RN 7446-14-2 HCA
CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

CC 59-2 (Air Pollution and Industrial Hygiene)
Section cross-reference(s): 56
IT 471-34-1, Calcium carbonate, occurrence 1306-23-6, Cadmium sulfide (CdS), occurrence 1309-37-1, Iron oxide (Fe₂O₃), occurrence 1314-98-3, Zinc sulfide (ZnS), occurrence 1317-36-8, **Lead oxide (PbO)**, occurrence 1317-61-9, Iron oxide (Fe₃O₄), occurrence 1345-25-1, Iron oxide (FeO), occurrence 7439-92-1, Lead, occurrence 7446-14-2, Sulfuric acid, lead(2+) salt (1:1) 7758-95-4, Lead chloride 10124-36-4, Cadmium sulfate 10290-71-8, Iron carbonate 12068-85-8, Iron sulfide (FeS₂)
RL: POL (Pollutant); OCCU (Occurrence)

(microchem. investigations of dust emitted by lead smelter)

L58 ANSWER 10 OF 23 HCA COPYRIGHT 2005 ACS on STN

130:184806 The curing reaction study of the active material in the lead-acid **battery**. Laruelle, S.; Grugeon-Dewaele, S.; Torcheux, L.; Delahaye-Vidal, A. (Laboratoire de Reactivite et de Chimie des Solides, UPRES-A 6007, Universite de Picardie Jules Verne, Amiens, 80039, Fr.). Journal of Power Sources, 77(1), 83-89 (English) 1999. CODEN: JPSODZ. ISSN: 0378-7753. Publisher: Elsevier Science S.A..

AB A study of the curing reaction involved in the pos. plate of the lead-acid **battery** has been undertaken. The variation of the different parameters of the curing reaction has shown the possibility of changing the 4BS needles dimensions. In particular, the addn. of a surfactant agent, namely the polyvinylpyrrolidone, to the reagents allows the obtention of tailor-made 4BS particles useable in the industrial prepn. of the pos. plates.

IT **12202-17-4**, Lead oxide sulfate (Pb4O3(SO4))
 RL: FMU (Formation, unclassified); RCT (Reactant); FORM (Formation, nonpreparative); **RACT (Reactant or reagent)**
 (curing reaction study of active material in lead-acid **battery**)

RN 12202-17-4 HCA

CN Lead oxide sulfate (Pb4O3(SO4)) (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
O4S	1	14808-79-8
Pb	4	7439-92-1

IT **1317-36-8**, Lead monoxide, reactions

RL: RCT (Reactant); **RACT (Reactant or reagent)**
 (curing reaction study of active material in lead-acid **battery**)

RN 1317-36-8 HCA

CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)

O=Pb

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST lead **battery** active material curing reaction

IT **Battery** cathodes

(curing reaction study of active material in lead-acid **battery**)

IT Secondary **batteries**

- (lead-acid; curing reaction study of active material in lead-acid
battery)
- IT 12065-90-6, Lead oxide sulfate ($\text{Pb}_5\text{O}_4(\text{SO}_4)$)
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(curing reaction study of active material in lead-acid
battery)
- IT 12202-17-4, Lead oxide sulfate ($\text{Pb}_4\text{O}_3(\text{SO}_4)$)
RL: FMU (Formation, unclassified); RCT (Reactant); FORM (Formation,
nonpreparative); **RACT (Reactant or reagent)**
(curing reaction study of active material in lead-acid
battery)
- IT 9003-39-8, Polyvinylpyrrolidone
RL: MOA (Modifier or additive use); USES (Uses)
(curing reaction study of active material in lead-acid
battery)
- IT 1317-36-8, Lead monoxide, reactions
RL: RCT (Reactant); **RACT (Reactant or reagent)**
(curing reaction study of active material in lead-acid
battery)
- L58 ANSWER 11 OF 23 HCA COPYRIGHT 2005 ACS on STN
- 128:28740 The activity of substrates in the catalyzed nucleation of
undercooled melts and aqueous aerosols. Gutzow, I.; Todorova, S.;
Vassilev, T.; Dobрева, A. (Institute Physical Chemistry, Sofia,
1113, Bulg.). Crystal Research and Technology, 32(7), 893-916
(English) 1997. CODEN: CRTEDF. ISSN: 0232-1300. Publisher:
Akademie Verlag GmbH.
- AB The aim of the present contribution is to analyze and to correlate
the exptl. evidence on the catalyzed nucleation in the crystn. of
undercooled melts. This is done by using a new, generalized theor.
approach accounting for both the thermodyn. of adhesion (i.e. the
interface bonding) and for correcting structural factors. Beside
the usually considered lattice discrepancy substrate/overgrowing
crystal in the present contribution as an addnl. structural
corrective is introduced the polarizability of the building units of
both interface constituents. Such a combined approach gives for the
1st time a way to correlate quant. expt. and theory in the case both
of **heterogeneous** meteorol. important nucleation catalysis
and in the crystn. of glass-forming org. and inorg. polymer melts.
This approach leads to the possibility of predicting further
promising nucleation catalysts and esp. appropriate substrates in
the induced crystn. of ice from undercooled water. An addnl.
advantage of the theor. concept derived here is that it allows also
the detn. of nucleation activity, Φ , of amorphous substrates or
of crystn. cores with distorted structure - i.e. in cases, where the
lattice discrepancy approach is impossible from the very beginning.
Two main sources of exptl. data are used: crystn. of aq. aerosols
induced by various crystn. cores and the **heterogeneous**
crystn. of undercooled glass-forming melts. Thus a new soln. of n

classical problem is attempted which may be of use in both meteorol. and in the tech. applications of induced nucleation by using foreign substrates.

IT 1317-36-8, **Lead monoxide**, properties

7446-14-2, **Lead sulfate**

RL: PRP (Properties)

(crystn. core activity in catalyzed crystal nucleation of ice from aq. aerosols)

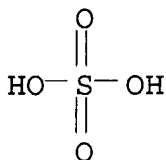
RN 1317-36-8 HCA

CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)

O=Pb

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

CC 75-1 (Crystallography and Liquid Crystals)

IT 151-50-8, Potassium cyanide 471-34-1, Calcium carbonate, properties 513-77-9, Barium carbonate 1302-09-6, Silver selenide 1304-56-9, Beryllia, properties 1306-23-6, Cadmium sulfide, properties 1306-24-7, Cadmium selenide, properties 1306-25-8, Cadmium telluride, properties 1307-96-6, Cobalt monoxide, properties 1308-38-9, Chromia, properties 1309-37-1, Ferric oxide, properties 1309-48-4, Magnesia, properties 1313-99-1, Nickel monoxide, properties 1314-13-2, Zinc oxide, properties 1314-20-1, Thoria, properties 1314-62-1, Vanadia, properties 1314-87-0, Lead monosulfide 1314-98-3, Zinc sulfide, properties 1315-09-9, Zinc selenide 1317-35-7, Manganese oxide (Mn3O4) 1317-36-8, **Lead monoxide**, properties 1317-37-9, Ferrous sulfide 1317-38-0, Cupric oxide, properties 1317-39-1, Cuprous oxide, properties 1317-42-6, Cobalt monosulfide 1317-61-9, Iron oxide (Fe3O4), properties 1344-28-1, Alumina, properties 7440-22-4, Silver, properties 7446-14-2, **Lead sulfate** 7447-40-7, Potassium chloride, properties 7447-41-8, Lithium chloride, properties 7487-94-7, Mercuric chloride, properties 7553-56-2, Iodine, properties 7631-86-9, Silica, properties 7647-14-5, Sodium chloride,

properties 7647-15-6, Sodium bromide, properties 7681-11-0,
 Potassium iodide, properties 7681-49-4, Sodium fluoride,
 properties 7681-65-4, Cuprous iodide 7681-82-5, Sodium iodide,
 properties 7758-02-3, Potassium bromide, properties 7758-88-5,
 Cerium trifluoride 7758-89-6, Cuprous chloride 7758-95-4, Lead
 dichloride 7758-98-7, Copper sulfate, properties 7774-29-0,
 Mercuric iodide 7782-42-5, Graphite, properties 7783-40-6,
 Magnesium fluoride 7783-46-2, Lead difluoride 7783-49-5, Zinc
 fluoride 7783-86-0, Iron diiodide 7783-90-6, Silver chloride,
 properties 7783-96-2, Silver iodide 7785-23-1, Silver bromide
 7787-32-8, Barium fluoride 7787-64-6, Bismuth iodide 7789-23-3,
 Potassium fluoride 7789-24-4, Lithium fluoride, properties
 7789-28-8, Iron difluoride 7789-47-1, Mercuric bromide
 7789-48-2, Magnesium bromide 7789-75-5, Calcium fluoride,
 properties 7790-30-9, Thallium monoiodide 7790-79-6, Cadmium
 fluoride 7790-80-9, Cadmium iodide 10025-73-7, Chromium chloride
 (CrCl₃) 10031-22-8, Lead dibromide 10101-63-0, Lead diiodide
 10102-68-8, Calcium iodide 10108-64-2, Cadmium chloride
 10112-91-1, Mercurous chloride 10139-47-6, Zinc iodide
 10377-58-9, Magnesium iodide 13462-88-9, Nickel dibromide
 15385-58-7, Mercurous bromide 15596-85-7, Cobalt iodide (CoI₃)
 16812-54-7, Nickel monosulfide 18282-10-5, Tin dioxide
 21548-73-2, Silver sulfide 22205-45-4, Cuprous sulfide
 158033-64-8, Antimony, compd. with magnesium (1:1)

RL: PRP (Properties)

(crystn. core activity in catalyzed crystal nucleation of ice
 from aq. aerosols)

L58 ANSWER 12 OF 23 HCA COPYRIGHT 2005 ACS on STN

123:174900 Rotating ring-disk electrode study of the PbSO₄/PbO₂
 transformation process. Wei, Guolin; Wang, Jiarong (Dep. Chem.,
 Shanghai Univ., Shanghai, 201800, Peop. Rep. China). Dianchi,
 25(3), 114-17 (Chinese) 1995. CODEN: DNCHEP. ISSN: 1001-1579.
 Publisher: Dianchi Zazhishe.

AB The mechanism of the oxidn. process of PbSO₄ to PbO₂ was
 investigated with the rotating ring-disk electrode method, together
 with cyclic voltammetry and potential-step methods. The exptl.
 results showed that the oxidn. process proceeded within the solid
 film forming on the disk electrode surface. The ring current
 response during the process was due to the dissoln. of PbO₂ formed
 at the disk electrode.

IT 1309-60-0, Lead dioxide 7446-14-2, Lead sulfate

RL: RCT (Reactant); **RACT (Reactant or reagent)**

(rotating ring-disk electrode study of the PbSO₄/PbO₂
 transformation process)

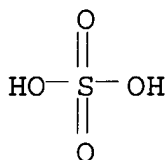
RN 1309-60-0 HCA

CN Lead oxide (PbO₂) (8CI, 9CI) (CA INDEX NAME)



RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72

ST lead sulfate oxide transformation electrode **battery**

IT Electrodes

(**battery**, rotating ring-disk electrode study of the
PbSO₄/PbO₂ transformation process)

IT 1309-60-0, Lead dioxide 7446-14-2, Lead sulfate

RL: RCT (Reactant); **RACT (Reactant or reagent)**

(rotating ring-disk electrode study of the PbSO₄/PbO₂
transformation process)

L58 ANSWER 13 OF 23 HCA COPYRIGHT 2005 ACS on STN

113:67304 Nucleation of **lead sulfate** in porous
lead-dioxide electrodes. Bernardi, Dawn M. (Phys. Chem. Dep., Gen.
Mot. Res. Lab., Warren, MI, 48090-9055, USA). Journal of the
Electrochemical Society, 137(6), 1670-81 (English) 1990. CODEN:
JESOAN. ISSN: 0013-4651.

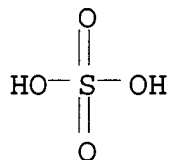
AB A 1-dimensional math. model of a porous lead-dioxide electrode is
described and used to investigate **lead-sulfate**
nucleation and growth during discharge. Derivation of a nucleation
rate expression that is based on classical, **heterogeneous**
nucleation theory is outlined. An electrochem. kinetic expression
is derived based on a reaction mechanism involving elementary steps,
and concd. ternary electrolyte theory is used in formulating
material-transport equations. Nucleation and electrochem. kinetic
parameters are estd. by comparison of model results with exptl.
results available in the literature. The interplay of nucleation
and growth kinetics of **lead sulfate** is
responsible for the initial min. in the voltage-time curve that is
commonly obsd. during const.-current discharge. The model simulates
the voltage min., which is referred to as the coup de fouet, and

calcs. the degree of lead-ion supersatn., the no. d. of **lead-sulfate** particles, and the free energy of formation as well as the size of crit. nuclei. The model also predicts a disappearance of the voltage min. with the addn. of seed particles for **lead-sulfate** nucleation, which is exptl. obsd. The satisfactory agreement between model and exptl. results confirms that the voltage dip is caused by a temporary oversatn. of lead ions during discharge and supports the proposed theor. approach.

IT **1309-60-0, Lead dioxide**
 RL: PRP (Properties)
 (electrodes, nucleation of **lead sulfate** in)
 RN 1309-60-0 HCA
 CN Lead oxide (PbO₂) (8CI, 9CI) (CA INDEX NAME)



IT **7446-14-2, Lead sulfate** (Pb(SO₄))
 RL: PRP (Properties)
 (nucleation of, in porous lead dioxide electrodes)
 RN 7446-14-2 HCA
 CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

CC 72-2 (Electrochemistry)
 Section cross-reference(s): 52, 75
 ST nucleation **lead sulfate** porous electrode;
 discharge lead dioxide electrode nucleation; simulation model
lead sulfate nucleation
 IT Free energy
 (of formation and nucleation of **lead sulfate**)
 IT Reduction, electrochemical
 (of lead dioxide, **lead sulfate** nucleation in)
 IT Crystal nucleation
 (of **lead sulfate** in porous lead dioxide
 electrode)
 IT Process simulation, physicochemical
 (of nucleation of **lead sulfate** in porous lead

- dioxide electrode)
- IT **1309-60-0, Lead dioxide**
 RL: PRP (Properties)
 (electrodes, nucleation of **lead sulfate** in)
- IT 7727-43-7, Barium sulfate (BaSO₄)
 RL: PRP (Properties)
 (in nucleation of **lead sulfate** in porous lead
 dioxide electrodes)
- IT **7446-14-2, Lead sulfate** (Pb(SO₄))
 RL: PRP (Properties)
 (nucleation of, in porous lead dioxide electrodes)

L58 ANSWER 14 OF 23 HCA COPYRIGHT 2005 ACS on STN

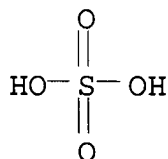
111:83302 Characterization of individual particles in the Antwerp aerosol. Van Borm, W. A.; Adams, F. C.; Maenhaut, W. (Univ. Antwerp, Wilrijk, B-2610, Belg.). Atmospheric Environment (1967-1989), 23(5), 1139-51 (English) 1989. CODEN: ATENBP. ISSN: 0004-6981.

AB About 8000 individual particles (0.2-15 .mu.m) in 16 12-h air particulate matter samples, taken at an urban site near Antwerp, Belgium, were analyzed by automated electron probe micro anal. (EPMA) for 26 elements and for morphol., including the projected particle diam. Also, the samples were analyzed by PIXE for total element anal. The particles could be divided into 6 main classes: soil dust, exhaust gases, sulfates, sea salt particles, biol. particles, and misc. anthropogenic emissions. Each class was split up into several particle types, of which the abundance (no. %), the temporal variation, size distribution, and chem. compn. were detd. Evidence was found of several atm. reactions, e.g., secondary SO₄2- formation by **heterogeneous** oxidn. of SO₂, SO₄2- condensation on existing fine and coarse particles and conversion of compds. as NaCl and PbBrCl into SO₄2-.

IT **7446-14-2, Lead sulfate**
 RL: POL (Pollutant); OCCU (Occurrence)
 (air pollution by aerosol contg., of Antwerp, Belgium)

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

CC 59-2 (Air Pollution and Industrial Hygiene)
 IT 1308-38-9, Chromium oxide, biological studies 1309-64-4, Antimony trioxide, biological studies 1314-13-2, Zinc oxide, biological studies 1327-53-3, Arsenic trioxide 1332-29-2, Tin oxide 1332-37-2, Iron oxide, biological studies 1335-25-7, **Lead oxide** 7439-89-6, Iron, biological studies 7439-92-1, Lead, biological studies 7439-95-4, Magnesium, biological studies 7439-96-5, Manganese, biological studies 7439-98-7, Molybdenum, biological studies 7440-02-0, Nickel, biological studies 7440-09-7, Potassium, biological studies 7440-17-7, Rubidium, biological studies 7440-21-3, Silicon, biological studies 7440-24-6, Strontium, biological studies 7440-32-6, Titanium, biological studies 7440-38-2, Arsenic, biological studies 7440-39-3, Barium, biological studies 7440-47-3, Chromium, biological studies 7440-50-8, Copper, biological studies 7440-62-2, Vanadium, biological studies 7440-66-6, Zinc, biological studies 7440-70-2, Calcium, biological studies 7446-08-4, Selenium dioxide **7446-14-2, Lead sulfate** 7704-34-9, Sulfur, biological studies 7723-14-0, Phosphorus, biological studies 7727-43-7, Barium sulfate 7758-98-7, Copper sulfate, biological studies 7782-49-2, Selenium, biological studies 10108-64-2, Cadmium chloride 10124-36-4, Cadmium sulfate 11129-60-5, Manganese oxide 13778-36-4, Lead bromide chloride (PbBrCl) 14871-68-2
 RL: POL (Pollutant); OCCU (Occurrence)
 (air pollution by aerosol contg., of Antwerp, Belgium)

L58 ANSWER 15 OF 23 HCA COPYRIGHT 2005 ACS on STN

107:60996 Catalytic oxidative coupling of methane. Baerns, Manfred; Da Silva, Palla Carreiro Joao Afonso; Bytyn, Wilfried (Fed. Rep. Ger.). Ger. Offen. DE 3534530 A1 19870409, 14 pp. (German). CODEN: GWXXBX. APPLICATION: DE 1985-3534530 19850927.

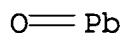
AB A continuous method for the **heterogeneous** oxidative catalytic coupling of CH₄ in the presence of O or O-contg. gases, to C_nH_m ($n \geq 2$; $m = 2n, 2n + 2$), consists of contacting mixts. of the gases at 500-900.degree., CH₄ partial pressure ≥ 0.5 bar and CH₄/O partial pressure ratio 1-20, in the presence of alkali metal, alk. earth metal, or Group IVA oxides, peroxides, hyperoxides, hydroxides, carbonates, sulfates, phosphates, and silicates as catalyst, with or without supports. A mixt. of 0.65 bar CH₄ and 0.078 bar O was fed at 3.44 g-s/mL through BeO (99% purity) in a tubular reactor, producing O transformation 99, CH₄ transformation 9, hydrocarbon selectivity 24, CO selectivity 29, CO₂ selectivity 47, C₂H₄ selectivity 9, C₂H₆ selectivity 15, and propylene and propyne selectivity 0.2%.

IT 1317-36-8, **Lead oxide (PbO)**,
 uses and miscellaneous **7446-14-2, Lead sulfate**
 RL: CAT (Catalyst use); USES (Uses)

(catalysts, for oxidative coupling of methane)

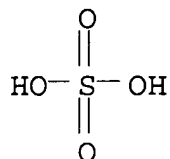
RN 1317-36-8 HCA

CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)



RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

IC ICM C07C002-84

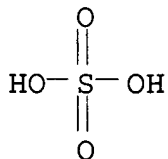
ICS C07C011-02; C07C009-02

CC 45-4 (Industrial Organic Chemicals, Leather, Fats, and Waxes)
Section cross-reference(s): 23, 67

IT 78-10-4, Silicon tetraethoxide 463-79-6D, alkali metal and alk. earth metal and Group IVA metal salts 497-19-8, Sodium carbonate, uses and miscellaneous 513-77-9, Barium carbonate 546-67-8, Lead IV acetate 584-08-7, Potassium carbonate 1304-28-5, Barium oxide, uses and miscellaneous 1304-29-6, Barium oxide (BaO₂) 1304-56-9, Beryllium oxide 1305-62-0, Calcium hydroxide, uses and miscellaneous 1310-58-3, Potassium hydroxide, uses and miscellaneous 1310-65-2, Lithium hydroxide 1310-73-2, Sodium hydroxide, uses and miscellaneous 1313-59-3, Sodium oxide, uses and miscellaneous 1313-60-6, Sodium oxide (Na₂O₂) 1314-11-0, uses and miscellaneous 1314-56-3, Diphosphorus pentoxide, uses and miscellaneous **1317-36-8, Lead oxide (PbO)**, uses and miscellaneous 1343-88-0, Magnesium silicate 1633-05-2, Strontium carbonate **7446-14-2, Lead sulfate** 7446-27-7, Lead phosphate [Pb₃(PO₄)₂] 7446-28-8, Strontium phosphate 7487-88-9, Magnesium sulfate, uses and miscellaneous 7631-99-4, uses and miscellaneous 7664-38-2D, alkali metal and alk. earth metal and Group IVA metal salts 7664-93-9, Sulfuric acid, uses and miscellaneous 7664-93-9D, alkali metal and alk. earth metal and Group IVA metal salts 7699-41-4D, alkali metal and alk. earth metal and Group IVA metal salts 7727-43-7, Barium sulfate 7757-82-6, Sodium sulfate, uses and miscellaneous 7757-87-1 7758-87-4, Calcium phosphate 7759-02-6, Strontium sulfate 7778-18-9, Calcium sulfate

7778-80-5, Potassium sulfate, uses and miscellaneous 7783-20-2, Ammonium sulfate, uses and miscellaneous 7790-69-4, Lithium nitrate 10022-31-8, Barium nitrate 10377-48-7, Lithium sulfate 12034-12-7 12136-45-7, Potassium oxide, uses and miscellaneous 13510-49-1, Beryllium sulfate 13826-65-8, Lead nitrite 13847-18-2, Barium phosphate 16509-24-3, Magnesium hydroxycarbonate 17014-71-0 18480-07-4, Strontium hydroxide
 RL: CAT (Catalyst use); USES (Uses)
 (catalysts, for oxidative coupling of methane)

- L58 ANSWER 16 OF 23 HCA COPYRIGHT 2005 ACS on STN
 104:153095 Pollution-free hydrometallurgical process for the recovery of lead from **battery** scrap. Soto, H.; Toguri, J. M. (Dep. Metall. Mater. Sci., Univ. Toronto, Toronto, ON, M5S 1A4, Can.). Recycle Second. Recovery Met., Proc. Int. Symp., 257-73. Editor(s): Taylor, Patrick R.; Sohn, Hong Yong; Jarrett, Noel. Metall. Soc.: Warrendale, Pa. (English) 1985. CODEN: 54WVAS. OTHER SOURCES: CASREACT 104:153095.
- AB The kinetics of the reactions between PbSO₄, PbO, and PbO₂ with K₂CO₃ and H₂SO₄ was studied to improve the recovery of Pb from **battery** scrap. A process was proposed which includes the treatment with concd. H₂SO₄ of a waste plate slurry to transform the PbO₂ layer into PbSO₄, and the transformation of PbSO₄ into PbCO₃ by treating with K₂CO₃. PbCO₃ is dissolved in acid recycled from the next step of electrolytic recovery of Pb. The process is characterized by the recycling of all effluents and the exclusion of pollution with SO₂ and lead oxides dust when conventional processing of **battery** scrap is used.
- IT **7446-14-2P**
 RL: RCT (Reactant); PREP (Preparation); **RACT (Reactant or reagent)**
 (reaction of, with potassium carbonate, lead recovery from **battery** scrap in relation to)
- RN 7446-14-2 HCA
 CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

- IT **1309-60-0P 1317-36-8P**, reactions
 RL: RCT (Reactant); PREP (Preparation); **RACT (Reactant or**

reagent)

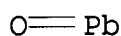
(reaction of, with sulfuric acid, lead recovery from
battery scrap in relation to)

RN 1309-60-0 HCA

CN Lead oxide (PbO₂) (8CI, 9CI) (CA INDEX NAME)

RN 1317-36-8 HCA

CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)



CC 54-2 (Extractive Metallurgy)

Section cross-reference(s): 52, 60

ST lead recovery **battery** scrap

IT Waste solids

(scrap, **battery**, lead recovery from, treatment with
sulfuric acid and potassium carbonate and electrowinning in)

IT 7664-93-9P, reactions

RL: RCT (Reactant); PREP (Preparation); RACT (Reactant or reagent)
(reaction of, with lead oxides, lead recovery from
battery scrap in relation to)

IT 584-08-7P

RL: RCT (Reactant); PREP (Preparation); RACT (Reactant or reagent)
(reaction of, with lead sulfate, lead recovery from
battery scrap in relation to)

IT **7446-14-2P**

RL: RCT (Reactant); PREP (Preparation); **RACT (Reactant or
reagent)**
(reaction of, with potassium carbonate, lead recovery from
battery scrap in relation to)

IT **1309-60-0P 1317-36-8P**, reactions

RL: RCT (Reactant); PREP (Preparation); **RACT (Reactant or
reagent)**

(reaction of, with sulfuric acid, lead recovery from
battery scrap in relation to)

IT 7439-92-1P, preparation

RL: PUR (Purification or recovery); PREP (Preparation)
(recovery of, from **battery** scrap, leaching with
sulfuric acid and potassium carbonate and electrowinning in)

L58 ANSWER 17 OF 23 HCA COPYRIGHT 2005 ACS on STN

99:148313 The redox cycling of lead alloys. Garche, J.; Bialacki, J.
A.; Hampson, N. A. (Chem. Dep., Univ. Technol., Loughborough/Leics.,
LE11 3TU, UK). Surface Technology, 19(4), 379-85 (English) 1983.
CODEN: SUTED8. ISSN: 0376-4583.

AB A series of potential-step expts. in 5M H₂SO₄ was made on a no. of alloys based on the compns. used in the Pb-acid industry. The specific effect of Sb is to increase the extent of the oxidative attack in the PbO₂-PbSO₄ regions. With impulse cycling, the surface layers appear to recrystallize to give more protective layers which resist both oxidative and subsequent reductive attack. PbO₂-PbSO₄ layers formed on Pb-Ca-Sn alloys are very susceptible to recrystn. on cycling.

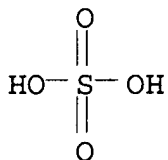
IT 7446-14-2

RL: RCT (Reactant); **RACT (Reactant or reagent)**

(oxidn. of, electrochem., on lead and lead alloys in sulfuric acid soln., lead dioxide formation in)

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

IT 1309-60-0

RL: RCT (Reactant); **RACT (Reactant or reagent)**

(redn. of, electrochem., on lead and lead alloys, lead sulfate formation in)

RN 1309-60-0 HCA

CN Lead oxide (PbO₂) (8CI, 9CI) (CA INDEX NAME)



CC 72-2 (Electrochemistry)

Section cross-reference(s): 52

ST redox cycling lead alloy; **battery** lead alloy redox cycling; oxide lead electroredn lead alloy; sulfate lead electrooxidn lead alloy

IT **Batteries**, secondary

(lead-acid, redox cycling of lead alloys in relation to)

IT 7446-14-2

RL: RCT (Reactant); **RACT (Reactant or reagent)**

(oxidn. of, electrochem., on lead and lead alloys in sulfuric acid soln., lead dioxide formation in)

IT 1309-60-0

RL: RCT (Reactant); **RACT (Reactant or reagent)**

(redn. of, electrochem., on lead and lead alloys, lead sulfate formation in)

L58 ANSWER 18 OF 23 HCA COPYRIGHT 2005 ACS on STN

88:39714 Cyclic voltammetry on lead electrodes in sulfuric acid solution. Visscher, W. (Lab. Electrochem., Eindhoven Univ. Technol., Eindhoven, Neth.). Journal of Power Sources, 1(3), 257-66 (English) 1977. CODEN: JPSODZ. ISSN: 0378-7753.

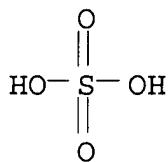
AB The oxidn. of Pb in 5M H2SO4 was studied by cyclic voltammetry. When a potential scan is applied from -1.0 to 2.6 V vs. reversible H electrode, the PbSO4/PbO2 oxidn. peak can be obsd. in the anodic voltammogram when the scan rate is .ltoreq.0.16 mV/s. When the potential scan is restricted to 0.6-2.6 V, the anodic voltammogram shows 2 peaks assigned to the formation of .alpha.-PbO2 and .beta.-PbO2, .alpha.-PbO2 being formed underneath the PbSO4 film. During the reverse sweep, the main redn. peak at 1.65 V corresponds to the redn. of .beta.-PbO2 to PbSO4. The potential of .alpha.-PbO2 redn. to nPbO.PbSO4 is not definite. The value of n increases from the oxide-electrolyte interface to the electrode interior. Addn. of small amts. of H3PO3 to H2SO4 electrolyte during the potential scanning increases the .alpha.-PbO2 peak and causes the disappearance of the .beta.-PbO2 peak.

IT 7446-14-2

RL: RCT (Reactant); **RACT (Reactant or reagent)**
(oxidn. of, electrochem., in sulfuric acid, cyclic voltammetry in)

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

IT 1309-60-0

RL: RCT (Reactant); **RACT (Reactant or reagent)**
(redn. of, electrochem., in sulfuric acid, cyclic voltammetry in)

RN 1309-60-0 HCA

CN Lead oxide (PbO2) (8CI, 9CI) (CA INDEX NAME)



- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
IT Electrodes
(**battery**, lead, oxidn. of, in sulfuric acid, cyclic
voltammetry in)
IT 7439-92-1, reactions **7446-14-2**
RL: RCT (Reactant); **RACT (Reactant or reagent)**
(oxidn. of, electrochem., in sulfuric acid, cyclic voltammetry
in)
IT **1309-60-0**
RL: RCT (Reactant); **RACT (Reactant or reagent)**
(redn. of, electrochem., in sulfuric acid, cyclic voltammetry in)
- L58 ANSWER 19 OF 23 HCA COPYRIGHT 2005 ACS on STN
86:56308 Stabilizer and lubricant composition for poly(vinyl chloride)
based on lead or other toxic metals. (Rousselot S. A., Fr.). Ger.
Offen. DE 2619958 19761202, 12 pp. (German). CODEN: GWXXBX.
APPLICATION: DE 1976-2619958 19760506.
- AB The title compns. are prepd. and homogenized without emission of
toxic dusts by stirring **PbO** or other metal oxides with
fatty acids at .apprx.70.degree. in the presence of catalysts,
cooling with continued stirring and addn. of other components to
give a **heterogeneous** granulate, and grinding and
homogenizing. Thus, stirring paraffin 130, tech. stearic acid 125,
PbO 150, and triethanolamine distearate (I) [13412-15-2]
(catalyst) 3 g 30 min at 80-90.degree. to complete reaction of
PbO, adding 300 g tribasic **Pb sulfate**,
200 g Ca stearate, and a little high-melting lubricant (i.a.
N,N'-ethylenebisstearamide), and cooling to 45.degree. gives small
blocks which are crushed and homogenized. In the absence of I,
PbO is <80% reacted after 1 h at 80-90.degree..
IT **1317-36-8**, reactions
RL: RCT (Reactant); **RACT (Reactant or reagent)**
(reaction of, with fatty acids, catalysts for)
RN 1317-36-8 HCA
CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)

O=Pb

- IC C08K005-09
CC 36-6 (Plastics Manufacture and Processing)
Section cross-reference(s): 59
IT 1304-28-5, reactions 1306-19-0, reactions **1317-36-8**,
reactions
RL: RCT (Reactant); **RACT (Reactant or reagent)**
(reaction of, with fatty acids, catalysts for)

L58 ANSWER 20 OF 23 HCA COPYRIGHT 2005 ACS on STN
84:93508 Chemical cause of passivation of steel by red lead. Lincke, G.

(Fachbereich Chem., Fachhochsch. Krefeld, Krefeld, Fed. Rep. Ger.).
FATIPPEC Congress, 11, 389-94 (German) 1972. CODEN: FAPVAP. ISSN:
0430-2222.

AB $\text{Fe}_2(\text{SO}_4)_3$ [10028-22-5] and FeSO_4 [7720-78-7] react with Pb_3O_4 [**1314-41-6**] in aq. soln. at 20.degree., breaking down the Pb_3O_4 crystal lattice and setting free $\text{Pb}(\text{II})$ to form **PbSO_4** . This reaction, which can be regarded as **heterogeneous** neutralization of the base (Pb_3O_4) with the acid (Fe salt), explains the chem. activity of Pb_3O_4 as an inhibiting pigment in paints. Corroded steel [12597-69-2] is converted to rust spots which contain $\text{FeSO}_4 \cdot \text{XH}_2\text{O}$ in contact with the surface, which are galvanic cells of the type $\text{Fe}/\text{FeSO}_4 \cdot \text{XH}_2\text{O}/\text{rust}$ and cause corrosion of steel. Reaction of Pb_3O_4 with FeSO_4 destroys the electrolyte, resulting in interruption of the current flow and drying and sealing of the rust spots.

IT **1314-41-6**

RL: RCT (Reactant); RACT (Reactant or reagent)
(reaction of, with iron sulfate in rust prevention of steel)

RN 1314-41-6 HCA

CN Lead oxide (Pb_3O_4) (8CI, 9CI) (CA INDEX NAME)

*** STRUCTURE DIAGRAM IS NOT AVAILABLE ***

CC 55-9 (Ferrous Metals and Alloys)

Section cross-reference(s): 72

ST **lead oxide** rust iron; corrosion inhibition red
lead; steel corrosion **lead oxide**; sulfate iron
steel corrosion

IT Rust (iron oxide)

RL: PROC (Process)

(prevention of, by **lead oxide** coating of
steel)

IT 12597-69-2, reactions

RL: PEP (Physical, engineering or chemical process); PROC (Process)
(corrosion of, **lead oxide** coating for
prevention of)

IT **1314-41-6**

RL: RCT (Reactant); RACT (Reactant or reagent)
(reaction of, with iron sulfate in rust prevention of steel)

IT 7720-78-7 10028-22-5

RL: RCT (Reactant); RACT (Reactant or reagent)
(reaction of, with **lead oxide** in rust
prevention of steel)

L58 ANSWER 21 OF 23 HCA COPYRIGHT 2005 ACS on STN

67:55202 Dispersion method of lead chromate [pigment] production.

Verkholtantsev, V. V. Lakokrasochnye Materialy i Ikh Primenenie (2),
4-6 (Russian) 1967. CODEN: LAMAAD. ISSN: 0130-9013.

AB **Heterogeneous** reaction of **PbO** with a
 $\text{Na}_2\text{Cr}_2\text{O}_7\text{-H}_2\text{SO}_4$ mixt. gave yellow and lemon-colored chromate pigments
having 5-13:1 and 0.5-2:1 $\text{PbCrO}_4/\text{PbSO}_4$ ratios, resp. A

25% soln. of a Na₂Cr₂O₇-H₂SO₄ mixt. was added to a 250-ml. dispersion of 71 g. **PbO** in H₂O at 60.degree., increasing the addn. rate from 1 to 3 ml./min. The mixt. was dild. to 700 ml., cooled to 35.degree., and mixed within 1-2 min. with the calcd. concn. of HCl. Formation of Pb oxychromate and oxysulfochromates was accompanied by decompn. of **PbO** crystals. The formation rate of their products depended on **PbO** cryst. structure, concn. of the pptg. soln., and morphotropic transition of rhombic **PbO** to the tetrahedral form. Rhombic **PbO** became more dispersed in the reaction medium than tetrahedral **PbO**. With increasing PbCrO₄/**PbSO₄** ratio, the light stability of the products increased.

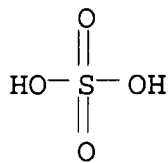
IT **7446-14-2**

RL: USES (Uses)

(lead chromate (PbCrO₄) pigments contg.)

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

CC 42 (Coatings, Inks, and Related Products)

IT Pigments

(lead chromate, contg. **lead sulfate**)

IT **7446-14-2**

RL: USES (Uses)

(lead chromate (PbCrO₄) pigments contg.)

IT 7758-97-6

RL: USES (Uses)

(pigments, contg. **lead sulfate (PbSO₄)**
)

L58 ANSWER 22 OF 23 HCA COPYRIGHT 2005 ACS on STN

19:21501 Original Reference No. 19:2788g-i Quadrivalent lead.

Sterba-Boehm, J.; Auerspergrova, M. Recueil des Travaux Chimiques des Pays-Bas et de la Belgique, 44, 390-9 (Unavailable) 1925.

CODEN: RTCPB4. ISSN: 0370-7539.

AB The purpose of this work, i. e., the prepn. of Pb disulfide was not attained. The reaction between PbO₂ and H₂S gas gives rise to a **heterogeneous** mass contg. besides unchanged PbO₂ a little S and **PbSO₄**. When the air is removed with CO₂ the reaction

is slow and incomplete even up to 150.degree.. Two reactions probably take place in one of which **PbO** and S are formed and in the other PbS and S. As the temp. rises to 90-100.degree. and above, the latter reaction predominates. In liq. H₂S at ordinary pressures PbO₂ reacts to give more free S and less PbS so that the 1st reaction seems to predominate. Even under these conditions the reaction is incomplete. K₂S in H₂O soln. reacts slowly and incompletely with PbO₂ at ordinary temps. and PbS is probably formed. H₂S gas acting on a soln. of PbCl₄ in MeOH gives only PbCl₂. The results show that PbS₂ is little stable or rather incapable of existing. This is comparable with what was found with PbI₄ and PbBr₄ and shows a great tendency of PbIV ions to be reduced to Pb++ and likewise of S-- to be oxidized to S.

CC 6 (Inorganic Chemistry)

IT **Lead oxide**

(PbO₂, reaction with H₂S)

L58 ANSWER 23 OF 23 HCA COPYRIGHT 2005 ACS on STN

19:6585 Original Reference No. 19:901g-i Catalysis of linseed oil oxidation. Slansky, P. Chem. Umschau, 31, 277-80 (Unavailable) 1924.

AB Pastes were made of linseed oil with Pb, **PbO**, PbO₂, PbCO₃, **PbSO₄**, PbCr₂O₇, Mn borate, MnO₂, MnCO₃, Co(AcO)₂, CuO, BaSO₄, CaSO₄, CaO, lampblack, graphite and Fe₂O₃, spread upon glass, and the time was noted when they ceased to adhere to the finger. Exposure to diffused daylight at room temp. was made in glass-covered boxes contg. CaCl₂; they were aired daily. The drying point always coincided with the max. increase in wt.; none of the substances went into soln. during drying (detd. by extg. the oil at different periods and noting its drying time which always agreed with that of the original oil); the O₂ of the driers did not contribute to the drying of the oil; lampblack, graphite and many org. colors retard drying; fine division of the driers increases the drying speed. S. concludes that atm. O₂ is adsorbed on the surface of the driers; that there is no sharp boundary line between **heterogeneous** and homogeneous catalysis; and that intermediate chem. reactions between catalyst and reacting substance are problematical.

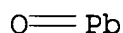
CC 26 (Paints, Varnishes, and Resins)

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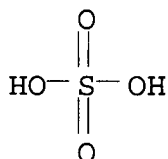
L59 ANSWER 1 OF 31 HCA COPYRIGHT 2005 ACS on STN

139:9180 Passivation phenomenon of low antimony alloys in deep discharge conditions of lead-acid **batteries**. Rocca, E.; Steinmetz, J. (UMR CNRS 7555, Laboratoire de Chimie du Solide Mineral, Universite Henri Poincare, Nancy I, Vandoeuvre-les-Nancy, F54506, Fr.). Journal of Electroanalytical Chemistry, 543(2), 153-160

- (English) 2003. CODEN: JECHES. Publisher: Elsevier Science B.V..
- AB The effects of the low antimony content and polarization time on passivation of lead-antimony alloys under deep discharge conditions of the lead-acid **batteries** were investigated at a potential of +0.7 V vs. Hg |Hg₂SO₄| K₂SO₄sat., in a 0.5 M H₂SO₄ soln. Electrochem. techniques and metallog. analyses revealed that the antimony level controls the elec. passivation of Pb-Sb alloys, used as pos. grid alloys. For low antimony alloys (Sb<0.75 wt. %), this passivation phenomenon is due to the formation of .alpha.-**PbO**, acting as an elec. barrier at the grid surface, and growing through a **solid-state** diffusion process of O²⁻ anions in a local elec. field. Thickness measurements and monitoring of **PbO** growth by electrochem. impedance spectroscopy have demonstrated, by computation of the diffusion coeff. and the diffusion resistance of O²⁻ anions, that antimony incorporated into the oxide acts as a doping element for its growth. At higher antimony levels, the two-phase alloys (lead matrix+Sb ppts.) promote the formation of a very thin layer of a Sb-rich oxide inhibiting the **PbO** growth.
- IT **1317-36-8, Lead oxide PbO, properties 7446-14-2, Lead sulfate**
 RL: FMU (Formation, unclassified); PRP (Properties); FORM (Formation, nonpreparative)
 (growth on lead low antimony alloys in H₂SO₄ soln.)
- RN 1317-36-8 HCA
- CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)



- RN 7446-14-2 HCA
- CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 56, 65, 72, 78
- ST lead antimony alloys passivation secondary **battery**
 impedance
- IT Reaction kinetics

(of **PbO** growth on lead low antimony alloys in H₂SO₄ soln.)

IT Passivation

Secondary **batteries**

(passivation phenomenon of low antimony alloys in deep discharge conditions of lead-acid **batteries**)

IT 1317-36-8, **Lead oxide PbO**,
properties 7446-14-2, **Lead sulfate**

RL: FMU (Formation, unclassified); PRP (Properties); FORM
(Formation, nonpreparative)

(growth on lead low antimony alloys in H₂SO₄ soln.)

IT 12610-59-2 12610-60-5 12613-85-3 12623-62-0 12683-71-5
12729-09-8 37304-72-6 61221-39-4 151675-30-8

RL: DEV (Device component use); USES (Uses)

(passivation phenomenon of low antimony alloys in deep discharge conditions of lead-acid **batteries**)

L59 ANSWER 2 OF 31 HCA COPYRIGHT 2005 ACS on STN

138:340899 Positive tubular plates of the lead-acid **battery**.

General analysis of the discharge process. D'Alkaine, C. V.; Impinisi, R. P.; Carubelli, A. (Chemistry Department, Federal University of Sao Carlos, CCT/UFSCar, Group of Electrochemistry and Polymers, Sao Carlos, SP, 13565-905, Brazil). Journal of Power Sources, 113(2), 293-300 (English) 2003. CODEN: JPSODZ. ISSN: 0378-7753. Publisher: Elsevier Science B.V..

AB A general anal. of the discharge process in stationary pos. tubular plates of lead-acid **batteries** is described. In the exptl. part, the influence of the rate of discharge and the sulfuric acid concn. on the potential/time (E/t) discharge curves, the variation of specific capacity and the plate resistance during the discharge transient was studied. The potential/time curves show the general pattern. The capacity is related to the complete discharge process and the plate resistance to the conditions in the transient plateau region of the potential/time curves. On this basis, it is shown that the tubular pos. discharge behavior can be interpreted with a zone reaction model involving three steps. The first corresponds to the **solid-state reaction** from PbO₂ to **PbO**, with passage of current; the second, when the current effectively moved to a deeper surface zone of the pore in the plate, to the chem. reaction between the **PbO** and H₂SO₄ giving fundamentally disrupted **PbSO₄**, and the third, to a recrystn. of the disrupted **PbSO₄**. With the help of this model, the effect of the depletion of H₂SO₄ in the macropores is also analyzed. All the results are interpreted on the basis of the model.

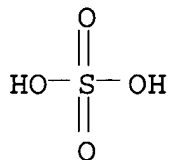
IT 7446-14-2, **Lead sulfate PbSO₄**

RL: CPS (Chemical process); FMU (Formation, unclassified); PEP (Physical, engineering or chemical process); PYP (Physical process); FORM (Formation, nonpreparative); PROC (Process)

(formation of, in elec discharge; general anal. of discharge process for pos. tubular plates of lead-acid **battery**)

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

IT 1309-60-0, **Lead oxide PbO₂**

RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)

(redn. of, in elec discharge; general anal. of discharge process for pos. tubular plates of lead-acid **battery**)

RN 1309-60-0 HCA

CN Lead oxide (PbO₂) (8CI, 9CI) (CA INDEX NAME)



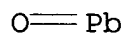
IT 1317-36-8, **Lead oxide PbO**, reactions

RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)

(sulfurization of, in elec discharge; general anal. of discharge process for pos. tubular plates of lead-acid **battery**)

RN 1317-36-8 HCA

CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)



CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST lead acid **battery** tubular electrode discharge process

IT **Battery** electrodes
Electric discharge

(general anal. of discharge process for pos. tubular plates of lead-acid **battery**)

IT Recrystallization

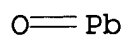
(in elec discharge; general anal. of discharge process for pos.

- tubular plates of lead-acid **battery**)
- IT Secondary **batteries**
(lead-acid; general anal. of discharge process for pos. tubular plates of lead-acid **battery**)
- IT 11149-67-0 516484-67-6, Antimony 8.9, lead 91, tin 0.1
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(**battery** electrodes; general anal. of discharge process for pos. tubular plates of lead-acid **battery**)
- IT 7446-14-2, Lead sulfate **PbSO₄**
RL: CPS (Chemical process); FMU (Formation, unclassified); PEP (Physical, engineering or chemical process); PYP (Physical process); FORM (Formation, nonpreparative); PROC (Process)
(formation of, in elec discharge; general anal. of discharge process for pos. tubular plates of lead-acid **battery**)
- IT 1309-60-0, Lead oxide **PbO₂**
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(redn. of, in elec discharge; general anal. of discharge process for pos. tubular plates of lead-acid **battery**)
- IT 1317-36-8, Lead oxide **PbO**, reactions
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(sulfurization of, in elec discharge; general anal. of discharge process for pos. tubular plates of lead-acid **battery**)
- L59 ANSWER 3 OF 31 HCA COPYRIGHT 2005 ACS on STN
- 131:110445 Studies on the **solid state reactions** of lead(II) compounds with sodium hydroxide at room temperature. Du, Jiang-Yan; Li, Ren-Yu; Zhu, Xiao-Lei; Chen, Chang-Yu; Zhou, Zhi-Hua (Dep. Chem., Nanjing Normal Univ., Nanjing, 210097, Peop. Rep. China). Wuji Huaxue Xuebao, 15(3), 383-387 (Chinese) 1999. CODEN: WHUXEO. ISSN: 1001-4861. Publisher: Wuji Huaxue Xuebao Bianjibu.
- AB The **solid state reactions** of Pb(II) compds. (Pb(OAc)₂·3H₂O, Pb(NO₃)₂, PbCl₂, **PbSO₄**) with NaOH were studied at room temp. The **reactions in solid state** are different from those in soln. The **solid state reaction** of lead acetate hydrate with NaOH was studied mainly, gave 3Pb(OAc)₂·**PbO**·H₂O and **PbO**. The other salts gave **PbO**. XRD, TG-DSC measurements were performed to characterize the **solid state reaction** process and products.
- IT 1317-36-8P, Lead oxide (**PbO**), preparation
RL: SPN (Synthetic preparation); PREP (Preparation)

(prepn. from lead(II) salts and sodium hydroxide)

RN 1317-36-8 HCA

CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)



IT 7446-14-2, Lead sulfate (PbSO₄)

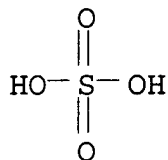
)

RL: RCT (Reactant); RACT (Reactant or reagent)

(reaction of divalent lead salts with sodium hydroxide in soln. and **solid state**)

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

CC 78-9 (Inorganic Chemicals and Reactions)

IT 1317-36-8P, Lead oxide (PbO),

preparation

RL: SPN (Synthetic preparation); PREP (Preparation)

(prepn. from lead(II) salts and sodium hydroxide)

IT 1310-73-2, Sodium hydroxide (NaOH), reactions 6080-56-4, Lead diacetate trihydrate 7446-14-2, Lead

sulfate (PbSO₄) 7758-95-4, Lead chloride (PbCl₂)

10099-74-8, Lead nitrate (Pb(NO₃)₂)

RL: RCT (Reactant); RACT (Reactant or reagent)

(reaction of divalent lead salts with sodium hydroxide in soln. and **solid state**)

L59 ANSWER 4 OF 31 HCA COPYRIGHT 2005 ACS on STN

127:68431 The kinetic mechanism of the PbO₂ discharge of the lead/acid positive plates. D'Alkaine, C. V.; Carubelli, A.; Lopes, M. C. (Group of Electrochemistry and Polymers, DQ-UFSCar., CP 676, 13565-905, Sao Carlos SP, Brazil). Journal of Power Sources, 64(1-2), 111-115 (English) 1997. CODEN: JPSODZ. ISSN: 0378-7753. Publisher: Elsevier.

AB A kinetic mechanism is proposed for the discharge reaction of pos. plates of lead/acid **batteries**. It includes several steps occurring at different times in each part of the electrode surface.

The mechanism takes into account **solid-state reactions** at the beginning followed by a dissoln./pptn. mechanism. On this basis, exptl. data are presented to show that the mechanism implies an intermediate stage in which the product behaves as a continuous film. Finally, data are presented showing that, up to this intermediate stage, the reaction product is a form of **PbO** that will react later with H_2SO_4 to give **PbSO₄**.

IT 1309-60-0, Lead dioxide
 RL: DEV (Device component use); USES (Uses)
 (kinetic mechanism of the PbO_2 discharge of the lead/acid pos. plates)
 RN 1309-60-0 HCA
 CN Lead oxide (PbO_2) (8CI, 9CI) (CA INDEX NAME)



CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST **battery** lead dioxide cathode discharge kinetics
 IT **Battery** cathodes

(kinetic mechanism of the PbO_2 discharge of the lead/acid pos. plates)

IT 1309-60-0, Lead dioxide
 RL: DEV (Device component use); USES (Uses)
 (kinetic mechanism of the PbO_2 discharge of the lead/acid pos. plates)

L59 ANSWER 5 OF 31 HCA COPYRIGHT 2005 ACS on STN

127:53371 Influence of antimony on the properties of the anodic oxide layer formed on Pb-Sb alloys. Metikos-Hukovic, M.; Babic, R.; Brinic, S. (Department of Electrochemistry, Faculty of Chemical Engineering and Technology, University of Zagreb, Savska 16, PO Box 177, 10 000, Zagreb, Croatia). Journal of Power Sources, 64(1-2), 13-19 (English) 1997. CODEN: JPSODZ. ISSN: 0378-7753. Publisher: Elsevier.

AB Elec. and dielec. properties, changes in structure and kinetics of formation and redn. of anodic phase layers on Pb and Pb-Sb electrodes in H_2SO_4 have been studied by means of electrochem. and structure characterizing impedance spectroscopy methods. The results obtained were discussed with respect to the effectiveness of Sb on the **solid-state PbO**.fwdarw.PbOn and PbOn.fwdarw.PbO₂ transformations. It is found that Sb facilitates the appearance of a potential region in which non-stoichiometric mixed oxides are formed; it has a catalytic effect on the **PbO** into the PbOn transformation. The formation of the mixed oxide leads to a shift in the potential of the oxidn. of **PbSO₄** to PbO_2 of about 200 mV in comparison with the pure-Pb electrode. It seems that the obsd. effects could

explain why Sb prolongs the pos. plate cycle life. It was shown that the electrochem. impedance spectroscopy is a very sensitive and suitable method for in situ investigation of **solid-state** processes in the pos. lead/acid **battery** plate.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 56, 72

ST **battery** lead electrode antimony effect

IT **Battery** electrodes

(influence of antimony on the properties of the anodic oxide layer formed on Pb-Sb alloys)

IT Secondary **batteries**

(lead-acid; influence of antimony on the properties of the anodic oxide layer formed on Pb-Sb alloys)

L59 ANSWER 6 OF 31 HCA COPYRIGHT 2005 ACS on STN

121:234620 Effect of oxidation potential on **PbSO4**/PbO2 transformation. Wei, Guolin (Dep. Chem., Shanghai Univ. Sci. Technol., Shanghai, 201800, Peop. Rep. China). Dianchi, 24(4), 157-9 (Chinese) 1994. CODEN: DNCHEP. ISSN: 1001-1579.

AB The oxidn. process of **PbSO4** in the partially reduced anodic film on lead electrode at 1.1, 1.2, 1.3 and 1.4 V (vs. Hg/HgSO4) was investigated by potential step, a.c. impedance tracing and rotating ring-disc electrode methods. The partially reduced anodic film was formed by first anodizing lead electrode at 1.3 V for 20 min and then cathodizing at 0.9 V for 5 mins. The exptl. results showed that the quantity of PbO2 formed by the transformation process reaches its max. value within 1 min. When the oxidn. potential increased, the rate of the transformation process would also increase and more PbO2 would be formed. The structure of the anodic film after **PbSO4** was oxidized was similar to that before the redn. at 0.9 V. The transformation process was a **solid state** process. It proceeded first at the deepest part of the film and then towards the film surface gradually.

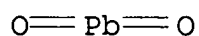
IT **1309-60-0**, Lead dioxide

RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)

(effect of oxidn. potential on **PbSO4**/PbO2 transformation)

RN 1309-60-0 HCA

CN Lead oxide (PbO2) (8CI, 9CI) (CA INDEX NAME)



CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72

ST **battery** lead oxide electrode

conversion; oxidn potential **lead oxide** electrode
conversion

IT Electric potential

(oxidn., effect of oxidn. potential on **PbSO4**/PbO2
transformation)

IT **1309-60-0**, Lead dioxide

RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or
reagent); USES (Uses)

(effect of oxidn. potential on **PbSO4**/PbO2
transformation)

L59 ANSWER 7 OF 31 HCA COPYRIGHT 2005 ACS on STN

118:150932 Three-elemental models for the positive electrode of the
lead/acid cell. I. Model development. Nilson, R. R. (Dep. Prod.
Technol., Massey Univ., Palmerston North, N. Z.). Journal of Power
Sources, 41(1-2), 1-12 (English) 1993. CODEN: JPSODZ. ISSN:
0378-7753.

AB Models for calcn. of the discharge capacity, discharge surface area,
and charge surface area of cathode active mass in a Pb-acid
battery were developed. The discharge capacity model is
based on equating soln. and **solid-phase** vol.
identities of the active mass. The discharge surface area model is
a simple approxn. of the likely changes in PbO2 with charge. The
charge surface area model gives actual and effective PbO2 surface
area changes with charge state as detd. from Pb2+
diffusion-controlled lobe growth within a sphere/box particle
geometry. The models were used to simulate the operation of the
Pb-acid **battery**.

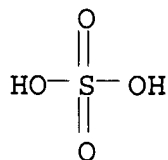
IT **7446-14-2P**, Lead sulfate (**PbSO4**

)

RL: FORM (Formation, nonpreparative); PREP (Preparation)
(formation of, in discharge of **lead oxide**
cathodes, modeling of)

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

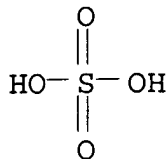
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST lead **battery** cathode modeling

- IT Simulation and Modeling, physicochemical
(geometric, elemental, of charge transfer in lead cathodes, in
batteries)
- IT Cathodes
(**battery**, lead, models for, development of)
- IT 7446-14-2P, Lead sulfate (**PbSO4**
)
RL: FORM (Formation, nonpreparative); PREP (Preparation)
(formation of, in discharge of **lead oxide**
cathodes, modeling of)
- L59 ANSWER 8 OF 31 HCA COPYRIGHT 2005 ACS on STN
113:100820 Passivation of the positive electrode of the lead/acid
battery: a consequence of self-discharge. Garche, J. (Dep.
Chem., Dresden Univ. Technol., Dresden, DDR-8027, Ger. Dem. Rep.).
Journal of Power Sources, 30(1-4), 47-54 (English) 1990. CODEN:
JPSODZ. ISSN: 0378-7753.
- AB Passivation of PbO2 cathodes of Pb-acid **batteries** is
caused by the reaction between the grid and the active material; the
cathodic reaction involves redn. of PbO2 followed by chem. reaction
of **PbO** with H2SO4 to form **PbSO4**. At low acid
concn. (1.01 g/cm3) the rate of the chem. reaction is low and a
nonconductive **PbO** layer builds up, leading to passivation.
When the H2SO4 concn. is high (1.28 g/cm3), a semi-permeable
PbSO4 membrane forms and no passivation is obsd. Parallel
to the liq. phase reaction and independent of acid concn., a
solid-state reaction also takes place
where **PbO** is formed in the corrosion layer, and
passivation occurs. In acid-flooded systems, passivation is obsd.
only after long periods of storage while in acid-starved systems the
decrease in acid concn. is rapid and passivation sets in after short
periods of storage. Passivation can be reversed; the extent of
passivation can be reduced by using Pb-Sn alloys and Sn coatings in
grids.
- IT 1309-60-0, Lead oxide (PbO2)
RL: USES (Uses)
(cathodes, passivation of, reaction mechanisms in, in lead-acid
batteries)
- RN 1309-60-0 HCA
CN Lead oxide (PbO2) (8CI, 9CI) (CA INDEX NAME)



- IT 7446-14-2P, Lead sulfate (**PbSO4**
)
RL: FORM (Formation, nonpreparative); PREP (Preparation)
(formation of, mechanism of, in lead-acid **batteries**,
lead dioxide cathode passivation in relation to)

RN 7446-14-2 HCA
 CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 72

IT Passivation
 (electrochem., of lead dioxide cathodes, in lead-acid
batteries, reaction mechanisms and sulfuric acid concn.
 effect on)

IT **1309-60-0, Lead oxide** (PbO₂)

RL: USES (Uses)

(cathodes, passivation of, reaction mechanisms in, in lead-acid
batteries)

IT 7664-93-9, Sulfuric acid, uses and miscellaneous

RL: USES (Uses)

(electrolyte, concn. of, in lead-acid **battery**, lead
 dioxide cathode passivation in relation to)

IT **7446-14-2P, Lead sulfate** (PbSO₄)

)

RL: FORM (Formation, nonpreparative); PREP (Preparation)

(formation of, mechanism of, in lead-acid **batteries**,
 lead dioxide cathode passivation in relation to)

L59 ANSWER 9 OF 31 HCA COPYRIGHT 2005 ACS on STN

110:118276 Effect of previous charge/discharge history on the capacity
 of the lead dioxide/**lead sulfate** electrode: the
 hysteresis or memory effect. Hullmeine, U.; Winsel, A.; Voss, E.
 (Forsch. Entwicklungszent., VARTA Batterie A.-G., Kelkheim, Fed.
 Rep. Ger.). Journal of Power Sources, 25(1), 27-47 (English) 1989.
 CODEN: JPSODZ. ISSN: 0378-7753.

AB The capacity level attained by Plante electrodes in cycling expts.
 depends on charge c.d., overcharge and discharge c.d. of the
 preceding discharges, and the relaxation after charge. The
 different effects obsd. for changes in charge and discharge
 parameters are closely related to the **solid-state**
 properties of PbO₂·Δ. An aggregate-of-spheres model has been
 developed to explain the various phenomena.

IT **1309-60-0, Lead dioxide**

RL: USES (Uses)

(electrodes, capacity of, previous charge-discharge history
effect on, in lead-acid **batteries**)

RN 1309-60-0 HCA

CN Lead oxide (PbO₂) (8CI, 9CI) (CA INDEX NAME)



CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72

ST **battery** lead dioxide electrode capacity; hysteresis effect
lead **battery** electrode

IT Electrodes

(**battery**, lead dioxide, capacity of, previous
charge-discharge history effect on)

IT 1309-60-0, Lead dioxide

RL: USES (Uses)

(electrodes, capacity of, previous charge-discharge history
effect on, in lead-acid **batteries**)

L59 ANSWER 10 OF 31 HCA COPYRIGHT 2005 ACS on STN

108:208216 Lead recovery from oxide or oxide-sulfate **battery**
scrap. Pretzsch, Klaus; Herbst, Karl Albrecht; Hanusch, Kunibert
(Preussag A.-G. Metall, Fed. Rep. Ger.). Ger. Offen. DE 3612491 A1
19871015, 4 pp. (German). CODEN: GWXXBX. APPLICATION: DE
1986-3612491 19860414.

AB The oxide- and sulfate-contg. waste is processed by: (1) preliminary
desulfurization by a recycled soln. contg. Na⁺, SO₄²⁻, OH⁻, CO₃²⁻,
and HCO₃⁻ to sep. a Na₂SO₄-contg. soln.; and (2) desulfurization by
aq. NaOH to sep. an oxide- and carbonate-contg. solid Pb fraction
from a plumbate-contg. alk. soln. The solid fraction is redn.
melted to obtain Pb. The soln. contg. SO₄²⁻, CO₃²⁻, OH⁻, and
[Pb(OH)₄]²⁻ is treated with CO₂ to ppt. 2 PbCO₃.Pb(OH)₂. After
filtration, the filtrate is recycled and used for preliminary
desulfurization of the scrap. Thus, 635 kg (PbO +
PbSO₄)-contg. **battery** scrap was 1st desulfurized
by the recycled filtrate after adjusting pH to 6-7. The filtrate
was then crystd. to obtain 170 kg Na₂SO₄ contg. 3 Pb and <2 ppm Fe.
The **solid phase** was desulfurized by using 126 kg
90% NaOH soln. and 3500 L water. The 552 kg product contg. 0.33% S
was directly reduced to Pb. The liq. phase contg. 4.8 g plumbate/L
was treated with CO₂ to obtain 22 kg 2PbCO₃.Pb(OH)₂. The filtrate
contg. 2 mg Pb/L was recycled to 1st-stage desulfurization.

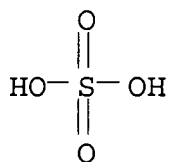
IC ICM C22B013-04

CC 54-2 (Extractive Metallurgy)

Section cross-reference(s): 49, 52

ST lead recovery **battery** scrap desulfurizing; sodium sulfate
recovery **battery** scrap

- IT Waste solids
(scrap, **battery**, lead recovery from)
- IT 1319-46-6P, Basic lead carbonate ($2\text{PbCO}_3 \cdot \text{Pb}(\text{OH})_2$) 7439-92-1P,
Lead, preparation 7757-82-6P, Sodium sulfate, preparation
RL: PUR (Purification or recovery); PREP (Preparation)
(recovery of, from **battery** scrap)
- L59 ANSWER 11 OF 31 HCA COPYRIGHT 2005 ACS on STN
- 101:139578 **Solid state** electro-oxidation processes
on lead and lead alloys in the lead(IV) oxide/lead(II) sulfate
regions. Hameenoja, E.; Hampson, N. A. (Dep. Chem., Univ. Technol.
Loughborough, Leicestershire, LE11 3TU, UK). Journal of Applied
Electrochemistry, 14(4), 449-58 (English) 1984. CODEN: JAE LBJ.
ISSN: 0021-891X.
- AB The results are presented of potential step expts. in 5M H_2SO_4 on Pb
and 2 Pb alloys of some com. importance. Differences in the
nucleation and growth processes of PbO_2 on **PbSO₄** were
obsd. as a result of the presence of the alloying ingredient. The
effect of Sb was very marked. Some reasons for the observations are
discussed.
- IT **7446-14-2**
RL: RCT (Reactant); RACT (Reactant or reagent)
(electrochem. formation and oxidn. of, on lead and lead alloys in
sulfuric acid soln., **battery** cycling in relation to)
- RN 7446-14-2 HCA
- CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

- IT **1309-60-0P**
RL: PREP (Preparation)
(formation of, electrochem., on lead and lead alloys,
battery cycling in relation to)
- RN 1309-60-0 HCA
- CN Lead oxide (PbO_2) (8CI, 9CI) (CA INDEX NAME)



- CC 72-2 (Electrochemistry)

- Section cross-reference(s): 52
- ST electrooxidn lead alloy **battery** cycling; oxide lead electroformation alloy; sulfate lead electroformation electrooxidn alloy
- IT Oxidation, electrochemical
(on lead and lead alloys, in sulfuric acid, **battery** cycling in relation to)
- IT Electrodes
(**battery**, secondary, lead and lead alloys in lead dioxide/**lead sulfate** region)
- IT **7446-14-2**
RL: RCT (Reactant); RACT (Reactant or reagent)
(electrochem. formation and oxidn. of, on lead and lead alloys in sulfuric acid soln., **battery** cycling in relation to)
- IT **1309-60-0P**
RL: PREP (Preparation)
(formation of, electrochem., on lead and lead alloys, **battery** cycling in relation to)
- IT 7440-36-0, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(lead alloy contg., **lead sulfate** electrochem. formation and oxidn. on, **battery** cycling in relation to)
- IT 60475-61-8 87308-82-5
RL: PRP (Properties)
(**lead sulfate** electrochem. formation and oxidn. on, in sulfuric acid, **battery** cycling in relation to)
- IT 7439-92-1, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(oxidn. of, electrochem., in sulfuric acid, cycling between **lead sulfate** and lead dioxide states in relation to)
- L59 ANSWER 12 OF 31 HCA COPYRIGHT 2005 ACS on STN
- 101:15422 The crystal structures of **PbO**.**PbXO4** (X = S, Cr, Mo) at 5K by neutron powder profile refinement. Mentzen, B. F.; Latrach, A.; Bouix, J.; Hewat, A. W. (Lab. Phys.-Chim. Miner. I, Univ. Claude-Bernard Lyon I, Villeurbanne, 69622, Fr.). Materials Research Bulletin, 19(5), 549-54 (English) 1984. CODEN: MRBUAC. ISSN: 0025-5408.
- AB The structures of **PbO**.**PbXO4** (X = S, Cr, Mo) were detd. at 5 K by neutron powder profile refinement. They are all isostructural with Lanarkite (the **SO4**), being based on the red **PbO** structure with **PbO22-** and its lone pair electrons replaced by **XO42-**. The structures were refined to final R's = 5.2, 8.4, and 4.7, resp. at. coordinates, cell data, and bond lengths and angles are given. A similar mechanism apparently produces the di-basic and tetra-basic oxides **nPbO**.**PbXO4**. These materials are of

relevance to **solid state reactions** in
lead-acid **battery** electrodes.

IT 12036-76-9

RL: PRP (Properties)

(crystal structure of)

RN 12036-76-9 HCA

CN Lead oxide sulfate ($\text{Pb}_2\text{O}(\text{SO}_4)$) (7CI, 8CI, 9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	1	17778-80-2
O4S	1	14808-79-8
Pb	2	7439-92-1

CC 75-8 (Crystallography and Liquid Crystals)

ST mol structure **lead oxide** sulfate; molybdate
oxide lead structure; chromate oxide lead structure

IT Crystal structure

Molecular structure

(of **lead oxide** sulfate, chromate and
molybdate)

IT 12036-76-9 14648-48-7 18454-12-1

RL: PRP (Properties)

(crystal structure of)

L59 ANSWER 13 OF 31 HCA COPYRIGHT 2005 ACS on STN

99:168459 Application of the Raman microprobe M.O.L.E. to the study of
solid phase reactions. Dhamelincourt,
M. C.; Dhamelincourt, P. (Lab. Spectrochim. Infrarouge Raman, Univ.
Sci. Tech. Lille, Villeneuve d'Ascq, 59655, Fr.). Raman Spectrosc.,
Proc. Int. Conf., 8th, 235-6. Editor(s): Lascombe, Jean; Huong,
Pham V. Wiley: Chichester, UK. (English) 1982. CODEN: 50HVAT.

AB The **solid-phase reaction** of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

with **PbO** at room temp. was studied by Raman microprobe
M.O.L.E. **PbO**, covering finely-ground $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ pellets,
was included into the sulfate matrix with 100 kg cm^{-2} pressure.
Identification of the reaction products by Raman microprobe anal.
permitted the proposal of a reaction mechanism. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ reacts
with **PbO** to give initially $\text{CuSO}_4 \cdot \text{H}_2\text{O}$ and then $\text{CuSO}_4 \cdot \text{CuO} +$
PbSO}_4 + \text{H}_2\text{O}.

IT 1317-36-8, **reactions**

RL: RCT (Reactant); RACT (Reactant or reagent)

(**solid-state reaction** of, with

copper sulfate pentahydrate, Raman microprobe anal. of)

RN 1317-36-8 HCA

CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)

O=Pb

- CC 78-9 (Inorganic Chemicals and Reactions)
 ST copper sulfate reaction **lead oxide**; Raman copper sulfate reaction oxide; MOLE copper sulfate reaction oxide
 IT **1317-36-8, reactions**
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (**solid-state reaction** of, with copper sulfate pentahydrate, Raman microprobe anal. of)
 IT 7758-99-8
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (**solid-state reaction** of, with **lead monoxide**, Raman microprobe anal. of)
- L59 ANSWER 14 OF 31 HCA COPYRIGHT 2005 ACS on STN
 92:206019 Mechanism of the electrochemical oxidation of lead to lead dioxide electrode in sulfuric acid solution. Pavlov, D.; Dinev, Z. (Cent. Lab. Electrochem. Power Sourc., Sofia, 1040, Bulg.). Journal of the Electrochemical Society, 127(4), 855-63 (English) 1980. CODEN: JESOAN. ISSN: 0013-4651.
- AB The electrode system Pb/**PbO/PbSO4** membrane/H2SO4 forms when a Pb electrode immersed in H2SO4 is in the potential range between 400 and +960 mV (vs. Hg/HgSO4 electrode). When the electrode potential is raised above +960 mV the **PbO** and **PbSO4** layers are oxidized to PbO2. The mechanism of this oxidn. is detd. by the elec. properties and the crystal structure of **PbO** and **PbSO4**. The 1st **PbO** is oxidized via **solid-phase reactions** to nonstoichiometric PbOn without a change of its crystal structure. This takes place via the electrochem. reaction $k\text{PbO} + m/2\text{H}_2\text{O} = k\text{PbOn} + m\text{H}^+ + m\text{e}^-$ which proceeds at the **PbO**/soln. interface. Since PbOn is a semiconductor, the oxidn. of the Pb2+ in its crystal lattice probably takes place through a mechanism in which surface states and mobile acceptors take part. When n reaches a crit. value $n = d$, .alpha.-PbO2 nucleation commences in the pores of the **PbSO4** membrane. When this phase reaches the H2SO4 the oxidn. of **PbSO4** crystals to .beta.-PbO2 begins.
- IT **1309-60-0P**
 RL: PREP (Preparation)
 (formation of, electrochem., in lead oxidn. in sulfuric acid)
 RN 1309-60-0 HCA
 CN Lead oxide (PbO2) (8CI, 9CI) (CA INDEX NAME)

O=Pb=O

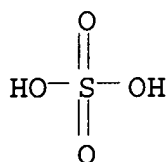
IT 7446-14-2

RL: PRP (Properties)

(membrane of, destruction of, in lead dioxide electrochem. formation)

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



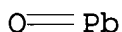
● Pb(II)

IT 1317-36-8, reactions

RL: RCT (Reactant); RACT (Reactant or reagent)
(oxidn. of, electrochem., lead dioxide formation in)

RN 1317-36-8 HCA

CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)



CC 72-11 (Electrochemistry)

IT 1309-60-0P

RL: PREP (Preparation)
(formation of, electrochem., in lead oxidn. in sulfuric acid)

IT 7446-14-2

RL: PRP (Properties)
(membrane of, destruction of, in lead dioxide electrochem. formation)

IT 1317-36-8, reactions

RL: RCT (Reactant); RACT (Reactant or reagent)
(oxidn. of, electrochem., lead dioxide formation in)

L59 ANSWER 15 OF 31 HCA COPYRIGHT 2005 ACS on STN

92:114168 Improved method for regenerating and recovering lead. Okuda, Masaaki; Tomisaki, Kiyotaka (Diamond Engineering K. K., Japan). Ger. Offen. DE 2856330 19790712, 25 pp. (German). CODEN: GWXXBX. APPLICATION: DE 1978-2856330 19781227.

AB A method is developed for the recovery of high-purity Pb from **PbSO₄**-contg. wastes, e.g. spent **batteries** and Pb-smelting flue dust. The wastes are treated with an alk. soln., preferably (NH₄)₂CO₃, to convert the **PbSO₄** into readily reducible PbCO₃ and obtain an (NH₄)₂SO₄ soln. from which (NH₄)₂CO₃ is regenerated by reacting with Ca(OH)₂ and CO₂. Thus, 2174 g of a

battery waste contg. 55.86% **PbSO₄** was ground to 80 mesh and treated with a soln. contg. 504 g (NH₄)₂CO₃ and 16,800 g H₂O at 25-28.degree. with stirring for 10-15 min. The **solid phase** was held in a rotary kiln at 400.degree. for 1 h for the conversion of PbCO₃ into **PbO**, the latter was mixed with 188 g powd. coke and 20 g limestone, and the redn. to metallic Pb was carried out in a rotary kiln at .apprx.700.degree. for 1 h. The **PbO** redn. degree was 98% and the total Pb recovery 96%. The liq. phase was treated with 445 g Ca(OH)₂ at 25-28.degree., the CaSO₄.2H₂O ppt. was sepd., and the soln. contg. 344 g NH₄OH and 16,400 g H₂O was contacted with CO₂ in a packed column. The regenerated soln. for treating the **PbSO₄** -contg. waste contained 470 g (NH₄)₂CO₃ and 16,480 g H₂O.

IC C22B013-04

CC 54-2 (Extractive Metallurgy)

Section cross-reference(s): 52

ST lead recovery leaching carbonate; ammonium carbonate leaching lead; sulfate lead leaching carbonate; **battery** scrap lead recovery; flue dust lead recovery

IT **Batteries**, secondary

(lead recovery from scrap, leaching with ammonium carbonate)

L59 ANSWER 16 OF 31 HCA COPYRIGHT 2005 ACS on STN

87:110764 Unexpected cases of reactions between solid substances at room temperature and normal pressure. Four different examples.

Garcia-Clavel, M. E.; Tejedor-Tejedor, M. I.; Martinez-Esparza, A. (Secc. Termoanal. React. Solidos, CSIC, Madrid, Spain). React. Solids, [Proc. Int. Symp.], 8th, Meeting Date 1976, 343-7.

Editor(s): Wood, John; Lindqvist, Oliver; Helgesson, Claes. Plenum: New York, N. Y. (English) 1977. CODEN: 36ETAQ.

AB The **solid-state reactions** of

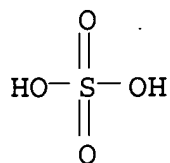
H₂C₂O₄.2H₂O with NiO and of CuSO₄.5H₂O with CdO and with .alpha.- and .beta.-**PbO** in air at room temp. were studied by DTA, thermogravimetry, x-ray diffraction, and IR spectroscopy.

IT **7446-14-2P**

RL: FORM (Formation, nonpreparative); PREP (Preparation)
(formation of, in **solid-state reaction** of copper sulfate pentahydrate with **lead oxide**)

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



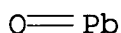
● Pb(II)

IT 1317-36-8, reactions

RL: RCT (Reactant); RACT (Reactant or reagent)
 (solid-state reactions of .alpha.-
 and .beta.-, with copper sulfate pentahydrate)

RN 1317-36-8 HCA

CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)



CC 78-9 (Inorganic Chemicals and Reactions)

ST **solid state reaction** hydrate oxide;
 oxalic acid hydrate reaction oxide; copper sulfate hydrate reaction
 oxide; sulfate copper hydrate reaction oxide; nickel oxide reaction
 oxalic acid; cadmium oxide reaction copper sulfate; **lead**
oxide reaction copper sulfate

IT **Reaction**

(solid-state, at room temp. and normal
 pressure)

IT 7790-84-3P

RL: FORM (Formation, nonpreparative); PREP (Preparation)
 (formation of, in **solid-state**
reaction of copper sulfate pentahydrate with cadmium
 oxide)

IT 1333-22-8P 12068-81-4P

RL: FORM (Formation, nonpreparative); PREP (Preparation)
 (formation of, in **solid-state**
reaction of copper sulfate pentahydrate with cadmium
 oxide and with **lead oxide**)

IT **7446-14-2P**

RL: FORM (Formation, nonpreparative); PREP (Preparation)
 (formation of, in **solid-state**
reaction of copper sulfate pentahydrate with **lead**
oxide)

IT 6018-94-6P

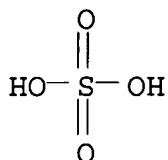
RL: FORM (Formation, nonpreparative); PREP (Preparation)
 (formation of, in **solid-state**

- reaction** of nickel monoxide with oxalic acid dihydrate)
- IT 1306-19-0, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(reaction of, with copper sulfate pentahydrate in **solid state**)
- IT 6153-56-6
RL: RCT (Reactant); RACT (Reactant or reagent)
(reaction of, with nickel monoxide in **solid state**)
- IT 1313-99-1, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(reaction of, with oxalic acid dihydrate in **solid state**)
- IT **1317-36-8, reactions**
RL: RCT (Reactant); RACT (Reactant or reagent)
(**solid-state reactions** of .alpha.- and .beta.-, with copper sulfate pentahydrate)
- IT 7758-99-8
RL: RCT (Reactant); RACT (Reactant or reagent)
(**solid-state reactions** of, with cadmium oxide and **lead oxide**)
- L59 ANSWER 17 OF 31 HCA COPYRIGHT 2005 ACS on STN
87:47519 Thermoanalytical study of the **solid-state reaction** between copper(2+) sulfate pentahydrate and .beta.-lead(2+) oxide. Garcia-Clavel, M. E.; Tejedor-Tejedor, M. I.; Burriel-Marti, F. (Fac. Cienc., Univ. Madrid, Madrid, Spain). Therm. Anal., Proc. Int. Conf., 4th, Meeting Date 1974, Volume 1, 541-53. Editor(s): Buzas, I. Heyden: London, Engl. (English) 1975. CODEN: 35UJAZ.
- AB CuSO4.5H2O reacts at room temp. in air with .beta.-**PbO** to give **PbSO4** and brochantite (Cu4(OH)6SO4), which upon calcination between 20 and 500.degree. undergoes dehydration to Cu4O3(SO4), which with excess .beta.-**PbO** and **PbSO4** at 500-660.degree. gives dolerophanite (Cu2O(SO4)), and a simultaneous exothermal reaction leads to the final products **PbSO4** and CuO. The vigorous dehydration of CuSO4.5H2O in the presence of .beta.-**PbO** at room temp. can be explained by the acidity and H bonding ability of the 4 H2O mols. attached to Cu2+. Two of these H2O mols. form weak H bonds with the **PbO** and this alteration of the CuSO4 lattice can be the cause of its dehydration. Also the dehydration is so violent that the released H2O forms a satd. CuSO4 soln. and thus the **reaction** is not **solid-state** but rather a satd. soln.-solid reaction.
- IT **7446-14-2P**
RL: FORM (Formation, nonpreparative); PREP (Preparation)
(formation of, in **solid-state reaction** of copper sulfate pentahydrate with .beta.-

lead oxide)

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

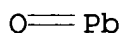
IT 1317-36-8, reactions

RL: RCT (Reactant); RACT (Reactant or reagent)

(reaction of .beta.-, with copper sulfate pentahydrate in
solid state)

RN 1317-36-8 HCA

CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)



CC 78-9 (Inorganic Chemicals and Reactions)

ST copper sulfate reaction **lead oxide**; dehydration
copper sulfate hydrate

IT Dehydration, chemical

(of copper sulfate pentahydrate in presence of .beta.-
lead oxide)

IT 1333-22-8P

RL: PREP (Preparation)

(formation and dehydration of, in **solid-state**
reaction of copper sulfate with **lead**
oxide)IT 1317-38-0P, preparation **7446-14-2P**

RL: FORM (Formation, nonpreparative); PREP (Preparation)

(formation of, in **solid-state**
reaction of copper sulfate pentahydrate with .beta.-
lead oxide)

IT 12015-77-9P

RL: FORM (Formation, nonpreparative); PREP (Preparation)

(formation of, in **solid-state**
reaction of copper sulfate with **lead**
oxide)

IT 1317-36-8, reactions

RL: RCT (Reactant); RACT (Reactant or reagent)

(reaction of .beta.-, with copper sulfate pentahydrate in

solid state)

IT 7758-99-8

RL: RCT (Reactant); RACT (Reactant or reagent)
(reaction of, with .beta.-**lead oxide** in
solid state)

L59 ANSWER 18 OF 31 HCA COPYRIGHT 2005 ACS on STN

83:185340 Physicochemical properties of oxide films on lead and its alloys. Aguf, I. A. (USSR). Sbornik Rabot po Khimicheskim Istochnikam Toka, 10, 34-49 (Russian) 1975. CODEN: SRKTBJ. ISSN: 0371-2621.

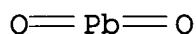
AB Factors that det. the properties of Pb [7439-92-1] electrodes of the sort conventionally used in storage cells are considered. When Pb is oxidized anodically in aq. H₂SO₄ a coating of **PbSO₄** [7446-14-2] is formed. When the surface is covered, local polarization leads to oxidn., forming PbO₂ [1309-60-0]. Pb²⁺ is oxidized to .alpha.- or .beta.-PbO₂ in the pores in **PbSO₄**. Anodic potential-time curves show no plateaus that correspond to the formation of PbO₂. Corrosion may result either from H⁺ or HSO₄⁻ passing through pores in the coating and reacting with **PbO**.xH₂O at the Pb surface, or from O₂⁻ or O diffusing through the solid PbO₂. Pb²⁺ can diffuse out through either the liq. or **solid phase**. The amt. of corroded Pb (P) is related to anodic charge (Q) passed by the equation $P = KQn$, where K apprxeq. 10⁻³ to 10⁻² g/cm²-A-hr, depending on temp., Pb alloy compn. and H₂SO₄ concn. (C), and 0.5 .ltoreq. n < 1, with the upper limit approached as c.d. increases. As Q increases, coating thickness approaches a limiting value because the outer surface crumbles as more is formed. Adherence of the film to the Pb is improved by the addn. of Ag [7440-22-4], Sb [7440-36-0], or Co [7440-48-4] to the Pb. The compn. of the coating varies with applied potential (.phi.) and C. The amt. of .beta.-PbO₂ in the film increases with decreasing c.d. and C, and with increasing temp. The addn. of Sb to the Pb causes an increase in the amt. of .beta.-PbO₂, possibly as a result of an increase in the permeability of the film, caused by anodic dissoln. of the Sb. The addn. of Ag to Pb, which increases the amt. of .beta.-PbO₂, inhibits anodic corrosion, possibly because of a protective coating of **PbO**. Ag in the Pb causes more, but smaller, pores in the PbO₂, so that there is little change in porosity caused by Ag. Small pores favor the formation of .beta.-PbO₂. Lowering the overvoltage for the oxidn. of H₂O and the addn. of Co to Pb lessens oxidative corrosion.

IT 1309-60-0P 7446-14-2P

RL: FORM (Formation, nonpreparative); PREP (Preparation)
(formation of, on lead electrode in **battery**)

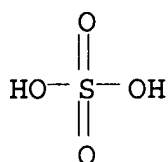
RN 1309-60-0 HCA

CN Lead oxide (PbO₂) (8CI, 9CI) (CA INDEX NAME)



RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

CC 72-2 (Electrochemistry)

ST lead corrosion **battery** electrode; film lead electrode; antimony lead electrode; silver lead electrode; cobalt lead electrode; elec potential lead alloy; impedance elec lead alloy

IT Electrodes

(**battery**, lead, physicochem. properties of oxide films on)

IT 1309-60-0P 7446-14-2P

RL: FORM (Formation, nonpreparative); PREP (Preparation)
(formation of, on lead electrode in **battery**)

L59 ANSWER 19 OF 31 HCA COPYRIGHT 2005 ACS on STN

83:21231 **Solid phase reaction** of the systems lead sulfide-ammonium nitrate and lead sulfide-ammonium nitrate-sodium chloride. III. Hincu, Iancu; Golgotiu, Tiberiu (Inst. Polytech., Iasi, Rom.). Buletinul Institutului Politehnic din Iasi, Sectia 2: Chimie, 19(1-2), 25-33 (French) 1973. CODEN: BICMCF. ISSN: 0373-3246.

AB **Solid-state reactions** in the systems

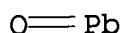
PbS-NH₄NO₃ and PbS-NH₄NO₃-NaCl were studied by DTA which indicated an endothermic peak at 180.degree. and an exothermic one at 380.degree.. The percentage of Pb, **PbO**, **PbSO₄**, unreacted PbS and also the sol. portion were detd. by chem. anal. The results were confirmed by x-ray anal.

IT 1317-36-8P, preparation 7446-14-2P

RL: FORM (Formation, nonpreparative); PREP (Preparation)
(formation of, in **solid-state reaction** of lead sulfide with ammonium nitrate)

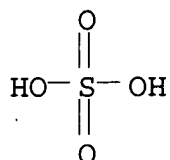
RN 1317-36-8 HCA

CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)



RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

CC 78-9 (Inorganic Chemicals and Reactions)

IT 1317-36-8P, preparation 7439-92-1P, preparation

7446-14-2P

RL: FORM (Formation, nonpreparative); PREP (Preparation)

(formation of, in **solid-state**

reaction of lead sulfide with ammonium nitrate)

L59 ANSWER 20 OF 31 HCA COPYRIGHT 2005 ACS on STN

69:110264 Double decompositions in the **solid phase**.

II. Electron microprobe and microscopic studies of diffusion mechanism of the **solid-phase reaction**

lead sulfide and cadmium oxide to form **lead oxide**

and cadmium sulfide. Leute, Volkmar (Univ. Muenchen, Munich, Fed. Rep. Ger.). Zeitschrift fuer Physikalische Chemie (Muenchen, Germany), 59(1-4), 91-108 (German) 1968. CODEN: ZPCFAX. ISSN: 0044-3336.

AB The microchem. nature of the reaction layer which formed during the **solid phase reaction** between PbS single crystals and polycryst. CdO was investigated with the electron microprobe. In contrast to the Wagner model the products **PbO** and CdS sepd. in different particle layers. The reaction layer was formed by opposing cation diffusion. Microscopic measurements on small crystals indicated that the reaction into PbS was 4 times as rapid as into CdO from which it was concluded that the polycryst. layer adjacent to the PbS crystal had unconverted PbS. At high temps. (690.degree.) the **solid phase reaction** proceeded by a different mechanism since only **PbSO4** could be shown as the reaction product.

CC 67 (Catalysis and Reaction Kinetics)

IT 1314-87-0

RL: RCT (Reactant); RACT (Reactant or reagent)

(reaction of, with cadmium oxide, mechanism of, in **solid state**)

IT 1306-19-0

RL: RCT (Reactant); RACT (Reactant or reagent)

(reaction of, with lead sulfide (PbS), mechanism of, in **solid state**)

L59 ANSWER 21 OF 31 HCA COPYRIGHT 2005 ACS on STN

69:110263 Double decompositions in the **solid phase**.

I. Kinetic studies of **solid-phase**

reactions between lead sulfide single crystals and polycrystalline cadmium oxide by microscopic methods. Leute, Volkmar (Univ. Muenchen, Munich, Fed. Rep. Ger.). Zeitschrift fuer Physikalische Chemie (Muenchen, Germany), 59(1-4), 76-90 (German) 1968. CODEN: ZPCFAX. ISSN: 0044-3336.

AB The kinetics of the **solid phase reaction**

of PbS and CdO yielding **PbO** and CdS was investigated microscopically at 463-618.degree.. X-ray data indicated that orthorhombic **PbO** and cubic CdS were formed as reaction products. At higher temps. (690.degree.), **PbSO4** was also found as a reaction product. While the vol. reaction obeyed the sq. rate law, the kinetics of the surface reaction was of zero-order.

CC 67 (Catalysis and Reaction Kinetics)

IT Kinetics, reaction

(of cadmium oxide with lead sulfide (PbS), in **solid state**)

IT 1314-87-0

RL: RCT (Reactant); RACT (Reactant or reagent)

(reaction of, with cadmium oxide, in **solid state**, kinetics of)

IT 1306-19-0

RL: RCT (Reactant); RACT (Reactant or reagent)

(reaction of, with lead sulfide (PbS), in **solid state**, kinetics of)

L59 ANSWER 22 OF 31 HCA COPYRIGHT 2005 ACS on STN

62:41909 Original Reference No. 62:7375b-d The discharge mechanism of lead dioxide electrode. Ikari, Shinichi; Yoshizawa, Shiro (Kobe Denki Kabushiki Kaisha, Osaka, Japan). Denki Kagaku, 28(11), 596-602 (Japanese) 1960. CODEN: DNKKA2. ISSN: 0366-9440.

AB During the PbO2 discharge, redn. starts, and a part of the Pb4+ becomes Pb2+ at the same location, and O is eliminated from the O layer and combined with H+ to become H2O. As the O evolves out of the O layer of PbO2 crystal, the cryst. lattice is slowly destroyed and converted into the next stable structure of PbOn. The structure of PbOn-type material formed is varied by the original PbO2 cryst. structure and by the conditions of discharge, but, in general, is a **solid soln. phase** of mixed **Pb oxides** rather than a single structure of Pb5O8, Pb2O5, or

Pb3O4. The resulting PbO_n is very unstable in H₂SO₄ soln. and decomp. into .alpha.-PbO₂ and **PbSO₄**. The reversible reaction of Pb to the oxide during the **battery** charge would be through the same type of mechanism; i.e. .alpha.-PbO₂ type material is formed through the stages of PbO_n type materials such as **PbO**, Pb3O4, and Pb5O8.

IT 1309-60-0, **Lead oxide**, PbO₂
(electrodes, discharge of, crystal structure and)
RN 1309-60-0 HCA
CN Lead oxide (PbO₂) (8CI, 9CI) (CA INDEX NAME)



CC 15 (Electrochemistry)
IT Electrodes
(**lead oxide**, discharge of, crystal structure and)
IT Crystal structure
(of **lead oxide** (PbO₂), discharge and)
IT 1309-60-0, **Lead oxide**, PbO₂
(electrodes, discharge of, crystal structure and)

L59 ANSWER 23 OF 31 HCA COPYRIGHT 2005 ACS on STN
57:46757 Original Reference No. 57:9304e-h Crystallogenesi in the forming of plates for the lead-acid storage **battery**.
Simon, A. C.; Jones, E. L. (U.S. Naval Res. Lab., Washington, DC).
Journal of the Electrochemical Society, 109, 760-70 (Unavailable) 1962. CODEN: JESOAN. ISSN: 0013-4651.

AB Changes in microstructure were observed during the forming of the pos. and neg. plates which provide clues as to the optimum conditions for formation. The microstructure produced depends on the conditions under which forming takes place. The conversion to PbO₂ in the pos. plate is initiated on the surface of a definite type of crystal, as yet not identified. The quantity, size, and shape of this crystal varies with the temp. and d. of the electrolyte and with the c. d. used. The indications were that a basic sulfate crystal is being converted directly to PbO₂, without change in external form, through some **solid-state reaction**. The conversion to Pb in the neg. plate is definitely by soln. of the **Pb sulfate** and deposition of reduced Pb. The form and size of the Pb crystals in the neg. plate can also be varied with the method of forming, but not to the extent of those in the pos. plate. While there was indication that subsequent life of the pos. plate might depend on the microstructure developed during forming, there was no such correlation found for the neg. plate.

IT 1309-60-0, **Lead oxide**, PbO₂
(crystals of, in storage-**battery** plates)

RN 1309-60-0 HCA
CN Lead oxide (PbO₂) (8CI, 9CI) (CA INDEX NAME)



CC 8 (Crystallization and Crystal Structure)
IT Crystals
(growth of, of Pb and PbO₂ in storage-**battery** plates)
IT Electrodes
(storage-**battery**, growth of Pb and PbO₂ crystals in)
IT 7439-92-1, Lead
(crystal structure in storage-**battery** plates)
IT 1309-60-0, Lead oxide, PbO₂
(crystals of, in storage-**battery** plates)

L59 ANSWER 24 OF 31 HCA COPYRIGHT 2005 ACS on STN

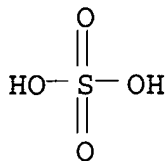
55:69456 Original Reference No. 55:13151e-f The reaction of cadmium oxide with ferrous and ferric sulfates. Zyryanov, M. N. (Council Natl. Economy, Irkutsk). Izvest. Sibir. Otdel. Akad. Nauk S.S.S.R. (No. 12), 96-100 (Unavailable) 1960.

AB Studies were conducted on the **solid-phase reactions** of CdO and Fe₂(SO₄)₃ at 300-700.degree., and of CdO and FeSO₄ at 150-600.degree.. When the reactants are combined in stoichiometric ratios, the conversion of CdO to sulfate in Fe₂(SO₄)₃ is 55% complete after 4 hrs. at 300.degree., and 81% complete at 500 and 600.degree.. At .gtoreq. 500.degree. virtually all the Fe₂(SO₄)₃ has completely decompd. When Fe₂(SO₄)₃ is present at .gtoreq.115% of stoichiometric, the conversion of CdO to sulfate reaches 94-8%. When FeSO₄ is used at 150% of stoichiometric the conversion of CdO to sulfate is 93% complete in 4 hrs. at 300.degree.. The presence of **PbO** and ZnO oxides (at 1-25 times the quantity of CdO) resulted in virtually complete conversion of the Pb, Zn, and Cd to the sulfate. Most of the sulfatization reaction occurs during the first hr. Above 700.degree., there is some indication the Cd ferrite forms.

IT 7446-14-2, Lead sulfate
(formation of, in **PbO** reaction with Fe sulfates)

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

IT 1317-36-8, Lead oxide, PbO
 (reactions of, with Fe sulfates)
 RN 1317-36-8 HCA
 CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)

O=Pb

CC 6 (Inorganic Chemistry)
 IT Iron sulfate
 (reactions of, with CdO, PbO and ZnO)
 IT 7446-14-2, Lead sulfate
 (formation of, in PbO reaction with Fe sulfates)
 IT 1317-36-8, Lead oxide, PbO
 (reactions of, with Fe sulfates)

L59 ANSWER 25 OF 31 HCA COPYRIGHT 2005 ACS on STN

49:35305 Original Reference No. 49:6761a-e Thermal decomposition of potassium chlorate. II. The effects of inert substances. Yamamoto, Sukenori; Asaba, Tetsuro (Univ. Tokyo). J. Ind. Explosives Soc. Japan, 13, 235-41 (Unavailable) 1952.

AB cf. ibid. 11, 190(1950). The elementary processes involved in the **solid-phase reaction** of the system KClO₃-MnO₂ were studied; the phase-boundary reaction was analyzed by using 80-100 mesh powders (activation energy being 40 kcal./mole) in which case the amt. of O evolved was proportional to time t below about 335.degree. (above 335.degree. the effect of the diffusion process appeared in such a manner as to decrease O₂ evolution). The diffusion activation energy was 75 kcal. from the expts. with 200-300-mesh powders in which the rate v was expressed by $v = \{1 - (1 - x)^{1/2}\}^2 r/t$, where r is the av. radius of KClO₃ powders and .times. is the fraction decompd. Above 380.degree., the m.p. of KClO₃, it was a homogeneous reaction of the 2nd order occurring in the fused phase with the rate proportional to the concns. of both components. The activation energy was 44 kcal. The addn. of KMnO₄ or K₂MnO₄ in place of MnO₂ made no difference in the kinetic behavior. KClO₄ was not detected; this suggests a different

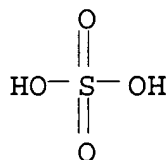
mechanism from the simple decompn. of KClO_3 . The effects of other substances than MnO_2 were examd. The gases H_2O , CO_2 , Cl_2 , and Br_2 did not enter the over-all reaction formula; NH_3 gave nitrate except in the presence of metal oxides; and SO_3 gave sulfate. The activity increased in the order of Cl , SO_3 , Br , and CO_2 , and the rate increased when the corresponding K salts were added, in the order KCl , K_2SO_4 , KBr , and K_2CO_3 . This shows that the larger reactivity resulted when the more stable product was formed. Other additives examd. were P_2O_5 , I_2O_5 , B_2O_3 , As_2O_5 , Sb_2O_4 , CoO , V_2O_5 , MnO_2 , Fe_2O_3 , CuO , Cr_2O_3 , ZnO , WO_3 , PbO_2 , Al_2O_3 , HgO , CaO , CaSO_4 , $\text{Ca}(\text{ClO}_4)_2$, CaCl_2 , $\text{Ca}(\text{NO}_3)_2$, $\text{Pb}(\text{NO}_3)_2$, PbCl_2 , **PbO** , **PbSO_4** , CuCl_2 , CuSO_4 , Cr_2O_3 , $\text{K}_2\text{Cr}_2\text{O}_7$, K_2CrO_4 , MnCl_2 , MnSO_4 , and Mn_3O_4 , and the ternary systems involving CuO/CaO , $\text{As}_2\text{O}_5/\text{CaO}$, $\text{As}_2\text{O}_5/\text{Na}_2\text{O}$, $\text{As}_2\text{O}_5/\text{K}_2\text{CO}_3$, $\text{Cr}_2\text{O}_3/\text{CaO}$, $\text{Cr}_2\text{O}_3/\text{Na}_2\text{O}$, $\text{Cr}_2\text{O}_3/\text{K}_2\text{CO}_3$, MnO_2/CaO , $\text{MnO}_2/\text{K}_2\text{CO}_3$, and $\text{MnO}_2/\text{Na}_2\text{O}$. The greater reactivity was obtained with additives of stronger acidity. Substances that form unstable intermediates are effective catalysts for the decompn. of KClO_3 .

IT **7446-14-2, Lead sulfate, PbSO_4**

(effect on KClO_3 decompn.)

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

CC 6 (Inorganic Chemistry)

IT **Lead oxide**

Potassium chromate

(effect on KClO_3 thermal decompn.)

IT **7446-14-2, Lead sulfate, PbSO_4**

7785-87-7, Manganese sulfate, MnSO_4

(effect on KClO_3 decompn.)

L59 ANSWER 26 OF 31 HCA COPYRIGHT 2005 ACS on STN

47:49511 Original Reference No. 47:8353e-g Mechanism of combustion chamber deposit formation with leaded fuels. Newby, W. E.; Dumont, L. F. (E. I. du Pont de Nemours & Co., Inc., Wilmington, DE). Journal of Industrial and Engineering Chemistry (Washington, D. C.), 45, 1336-42 (Unavailable) 1953. CODEN: JIECAD. ISSN: 0095-9014.

AB The inorg. Pb salt portion of these deposits was studied by thermodynamic calcns., lab. expts., and expts. in which a

single-cylinder engine is used as a reaction vessel. Gaseous **Pb oxide**, produced from the combustion of fuel contg. $\text{Pb}(\text{C}_2\text{H}_5)_4$, usually does not undergo vapor-state reactions. The solid **Pb oxide** which condenses on the walls has only a short life as a deposit constituent. It is attacked by acid gases to form simple Pb salts, **PbSO₄**, and Pb halides, or it reacts with the simple Pb salts in **solid state reactions** to form complex Pb oxy salts. The course of these reactions is controlled primarily by the deposit surface temp. which increases with thickness.

CC 22 (Petroleum, Lubricants, and Asphalt)

IT **Lead oxide**

(formation from leaded fuels in combustion chambers and reactions of)

IT 7439-92-1, Lead

(salts, formation from **Pb oxide** in combustion chambers of engines)

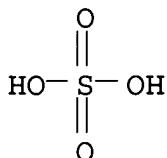
L59 ANSWER 27 OF 31 HCA COPYRIGHT 2005 ACS on STN

46:32222 Original Reference No. 46:5459h-i,5460a-b Electron-transfer reactions at lead electrodes. Thirsk, H. R.; Wynne-Jones, W. F. K. (Univ. Durham, Newcastle-on-Tyne, UK). Journal de Chimie Physique et de Physico-Chimie Biologique, 49, C131-4 (English) 1952. CODEN: JCPBAN. ISSN: 0021-7689.

AB A suggested mechanism of the reaction $\text{Pb} + \text{PbO}_2 + 2\text{H}_2\text{SO}_4 \rightarrow 2\text{PbSO}_4 + 2\text{H}_2\text{O}$ (the equil. shifts to the right on discharge and reverses on charge) is based on the assumption that an equil. exists at the pos. electrode between PbO_2 and the soln. contg. Pb^{4+} ions. On discharge, reduction of the Pb^{4+} ions takes place by electron transfer at the inert Pb electrode, the process being controlled by the $\text{Pb}^{4+}/\text{Pb}^{2+}$ oxidation-reduction system. At the neg. electrode Pb is converted to **PbSO₄**. However, there is no incontrovertible chem. evidence for the existence of Pb^{4+} ions. A new mechanism, which is based upon the discharge of OH^- ions and which does not require the existence of Pb^{4+} ions in soln., is: (1) $\text{Pb} + \text{SO}_4^{2-} \rightarrow 2\text{e}^- + \text{PbSO}_4$, (2) $2\text{H}_2\text{O} \rightarrow 2\text{H}^+ + 2\text{OH}^-$, (3) $\text{PbSO}_4 + 2\text{OH}^- \rightarrow \text{PbO}_2 + \text{SO}_4^{2-} + 2\text{H}^+$. PbO_2 is a very good elec. conductor. It is therefore suggested that the conversion of **PbSO₄** starts near the Pb/**PbSO₄** interface and continues through the **PbSO₄** deposit. During the process of discharge (reduction) it is suggested that the solid PbO_2 layer with its high free electron content reacts at the PbO_2 -soln. interface by a direct electron transfer in the **solid state**. Thus a $\text{Pb}^{4+} \rightarrow \text{Pb}^{2+}$ change is postulated at points on the surface where a favorable lattice arrangement permits simultaneous reaction of the freed O ions in the solid with H^+ ions in soln. Subsequently, the Pb^{2+} ions in the solid precipitate or react with SO_4^{2-} . The controlling feature is diffusion of H_2SO_4 to the PbO_2

layer. This becomes slower as reduction proceeds and the PbO₂ becomes covered with **PbSO₄**.

IT **7446-14-2, Lead sulfate, PbSO₄**
 (formation of, from Pb and PbO₂)
 RN 7446-14-2 HCA
 CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

IT **1309-60-0, Lead oxide, PbO₂**
 (reaction with Pb and H₂SO₄)
 RN 1309-60-0 HCA
 CN Lead oxide (PbO₂) (8CI, 9CI) (CA INDEX NAME)

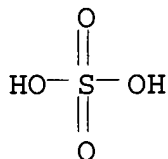


CC 4 (Electrochemistry)
 IT Storage **batteries**
 (reactions in Pb)
 IT **7446-14-2, Lead sulfate, PbSO₄**
 (formation of, from Pb and PbO₂)
 IT **1309-60-0, Lead oxide, PbO₂**
 (reaction with Pb and H₂SO₄)

L59 ANSWER 28 OF 31 HCA COPYRIGHT 2005 ACS on STN
 43:3773 Original Reference No. 43:870i,871a-c A new pigment concept.
 Williams, F. J.; Pitrot, A. R. Journal of Industrial and
 Engineering Chemistry (Washington, D. C.), 40, 1948-50 (Unavailable)
 1948. CODEN: JIECAD. ISSN: 0095-9014.
 AB A new type of pigment has been developed for use as an active basic
 pigment for exterior house paints. On the theory that only the
 surface of an active pigment is consumed in soap formation during
 the life of a paint film, a surface-coated pigment has been produced
 and tested. The adherent surface layer consists of monobasic lead
 silicate and monobasic **lead sulfate** cemented to
 silica. Production of the basic lead compds. as an adherent surface
 layer was achieved by **reaction** in the **solid**
state. Mixts. of extremely fine silica and hydrous tribasic
lead sulfate and, in some instances, **lead**

oxide were furnaced for 2 hrs. at 625.degree.. The resultant furnace products were disintegrated and formulated into single-pigment paints. Exposure tests in Florida showed that the pigments formed durable, usable paints with linseed oil. A compn. comprising **lead oxide** 47.9, silica 47.9, and SO₃ 4.2% was selected as optimum. From a consideration of the tinting-strength data and the microscopic appearance of the pigment particles, it has been shown that the method of prepn. results in pigment particles with a definite adherent surface layer on the silica grains. 15 references.

IT 7446-14-2, **Lead sulfate**
 (basic, mixt. with basic Pb silicate, SiO₂ coated with, as pigment for exterior paints)
 RN 7446-14-2 HCA
 CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



● Pb(II)

CC 26 (Paints, Varnishes, and Lacquers)
 IT Coating(s)
 (of silica with basic Pb-silicate-basic **Pb sulfate** mixt., basic pigments by)
 IT 7446-14-2, **Lead sulfate**
 (basic, mixt. with basic Pb silicate, SiO₂ coated with, as pigment for exterior paints)
 IT 11120-22-2, Lead silicate
 (basic, mixt. with basic **Pb sulfate**, SiO₂ coated with, as pigment for exterior paints)
 IT 7631-86-9, Silica
 (coated with basic Pb silicate and basic **Pb sulfate** or with **Pb oxide** and SO₃ as basic pigments)
 IT 7446-11-9, Sulfur trioxide
 (mixt. with NH₃, with **Pb oxide** and SiO₂ as active basic pigment)

L59 ANSWER 29 OF 31 HCA COPYRIGHT 2005 ACS on STN
 38:6238 Original Reference No. 38:910b-h **Reactions** in the **solid state**. Feigl, Fritz; Miranda, Luiz Inacio; Suter, Hans Alberto Anais da Academia Brasileira de Ciencias, 15,

151-86 (Unavailable) 1943. CODEN: AABCAD. ISSN: 0001-3765.

AB Reactions between solids do not occur rapidly. They do not occur if the reaction product remains in situ. The atoms or mols. are partially freed by heat, and a temp. near the m. p. or sublimation point is usually necessary. Temp., contact area and time are necessary, but not always sufficient. The only reactions reported are those that are reproducible and stoichiometric. Type A (reactions analogous to those in soln.): (1) When CuSO_4 or $\text{Fe}_2(\text{SO}_4)_3$ is heated with MgO , the color changes from white to gray (CuO) or brown (Fe_2O_3). (2) When MnSO_4 , NiSO_4 or CoSO_4 is heated with MgO in air, darker higher oxides of the heavy metals result. (3) HgCN , CuCN and AgCN are unaffected by Zn , and displacement is mol. and slow on heating WO_3 and MoO_3 with Zn . However, ionic displacement is apparent in a few min. on grinding Zn with Hg_2Cl_2 or HgI_2 (Hg droplets form) or with TlI , Cu_2I_2 or AgI (mixt. turns darker). (4) In 5 min. at 150.degree. to 200.degree. lakes of different tone than those formed by pptn. are formed between calcined MgO , BeO , TiO_2 , ZrO_2 , ThO_2 or Al_2O_3 and alizarin, purpurin, quinalizarin, etc. (5) Dimethylglyoxime heated to 200.degree. with $\text{Ni}(\text{CN})_2$ quickly forms the red complex. Ten other metal-org. complexes were formed at 120 to 250.degree.. (6) PbI_2 and TlI at 370.degree. with MnO_2 liberate I_2 . Type B (reactions not obtained in soln., usually because of insoly. of one or more reagents. Such reactions are mainly addns. of acidic and basic oxides, etc.): (1) Yellow WO_3 becomes white on reacting at 600 to 800.degree. with ZnO , MgO or CdO . Also $\text{V}_2\text{O}_5 + \text{ZnO}$, $\text{MoO}_3 + \text{PbO}$ and $\text{MoO}_3 + \text{CdO}$ become colorless. $\text{MnO}_2 + \text{WO}_3$ or MoO_3 also becomes colorless, with O_2 evolution. (2) Mg , Zn or Mn pyrophosphate or pyroarsenate heated with CdO , PbO , MnO_2 , CoO or CuO forms colorless addn. compds. (3) At 700.degree. CdO or PbO form colorless silicates with SiO_2 . Oxides of higher m. p., like CoO , NiO , Mn_3O_4 , do not react with SiO_2 at 700.degree.. (4) The colorless Ca salts, sol. in warm dil. HCl , of the heteropoly phosphotungstic and phosphomolybdic acids, may be produced by heating $\text{Ca}_3(\text{PO}_4)_2$ with WO_3 or MoO_3 . (5) Ba , Ca , Sr (but not Zn) carbonates undergo double decompn. with PbSO_4 . At dull red heat the PbCO_3 dissocs.; this proves the reaction took place. (6) At 250.degree., ZnO greatly catalyzes the oxidation of Cu_2I_2 by air, with liberation of I_2 . (7) When $\text{Hg}(\text{CN})_2$ or AgCN is heated to 180.degree. with Se the black selenide forms, probably by liberation of C_2N_2 from an addn. complex. (8) At 250.degree. a mixt. of red Ag_2CrO_4 and yellow TlI goes to yellow Tl_2CrO_4 and AgI . (9) HgI_2 combines at 100.degree. with Cu_2I_2 or AgI to form the highly colored double salts. The low reaction temp. is probably partially due to the transformation at 130.degree. between yellow and red HgI_2 .

CC 2 (General and Physical Chemistry)

L59 ANSWER 30 OF 31 HCA COPYRIGHT 2005 ACS on STN

22:12955 Original Reference No. 22:1518h-i,1519a Reactions in

the **solid state** at high temperatures. II.

Reaction velocities of exothermic reactions. Jander, Wilhelm Z. anorg. allgem. Chem., 166, 31-52 (Unavailable) 1927.

AB cf. C. A. 21, 3798. **Reactions** in the **solid state** depend upon general diffusion laws. Equations for the dependence of a reaction on time, particle size of the powd. components and temp. may be deduced. The dependence of reaction velocity on temp. is expressed theoretically by the equation $k' = C' e^{-a/T}$. T is the abs. temp. C' and a are consts. Endothermic reactions have been shown to obey this relation. Exothermic reactions require a somewhat different treatment because the heat evolved in the reaction produces local rises in temp. of the reacting parts of the mixt. Toward the end of a reaction, however, when the reaction velocity is so small that the heat of reaction is conducted uniformly throughout the reaction mixt., the equation given above should apply strictly. In the reactions $BaCO_3 + WO_3$.fwdarw. $BaWO_4 + CO_2$ (two different reaction mixts., 1 mol. $BaCO_3$ to 10 mols. WO_3 and an equimolar mixt.) and $Ag_2SO_4 + PbO$.fwdarw. $Ag_2O + PbSO_4$, the velocity of the end reaction is found to vary with temp. according to the equation given. From the difference between the velocities of the beginning and end reactions it is possible to det. the effective local temp. rise in the reacting parts of the mixt., this rise being as much as 100.degree. if the external temp. is high. The theoretical equation for dependence of the reaction on time and particle size, when the effect of the heat of reaction is allowed for, also represents the exptl. data satisfactorily.

IT 1317-36-8, **Lead oxide, PbO**
 (reaction with Ag_2SO_4 , velocity of)
 RN 1317-36-8 HCA
 CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)

O=Pb

CC 2 (General and Physical Chemistry)
 IT Temperature
 (high, **reactions** in **solid state** at)
 IT **Reactions**
 (in **solid state**, at high temps.)
 IT 1317-36-8, **Lead oxide, PbO**
 (reaction with Ag_2SO_4 , velocity of)
 IT 10294-26-5, Silver sulfate
 (reaction with **PbO**, velocity of)

L59 ANSWER 31 OF 31 HCA COPYRIGHT 2005 ACS on STN
 22:140 Original Reference No. 22:12i,13a A mode of application of Tammann's thermoanalysis to **reactions** between **solid phases**. Guillissen, J. Bull. sci. acad.

roy. Belg., 13, 233-8 (Unavailable) 1927.

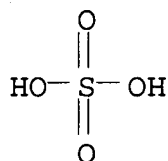
AB cf. following abstr. Tammann's method consists in detg. the heating curve of a mixt. of the solid reagents, then detg. the curve for the product of the reaction. The point at which the curves cease to coincide is taken as the reaction temp. The method can be rendered more sensitive if the curve temp. vs. time is replaced by the curve temp. vs. temp. difference, i. e., $f(\theta, \theta - \theta')$ = 0. The double galvanometer of Le Chatelier-Saladin may be used for that purpose. The reactions $\text{PbO} + \text{CuSO}_4 \rightarrow \text{PbSO}_4 + \text{CuO}$ and $\text{PbO} + \text{MoO}_3 \rightarrow \text{PbMoO}_4$ have been used to test the method. The results duplicate those obtained by Tammann. The production of $\text{Fe}_2\text{O}_4\text{Ba}$ is obtained at about 830.degree. from Fe_2O_3 and BaCO_3 , at about 300.degree. from Fe_2O_3 and BaO . An expt. with Fe_2O_3 and CaCO_3 was not conclusive.

IT 7446-14-2, Lead sulfate

(reaction, $\text{PbO} + \text{CuSO}_4 \rightarrow \text{PbSO}_4 + \text{CuO}$, application of Tammann's thermoanalysis to)

RN 7446-14-2 HCA

CN Sulfuric acid, lead(2+) salt (1:1) (8CI, 9CI) (CA INDEX NAME)



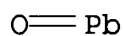
● Pb(II)

IT 1317-36-8, Lead oxide, PbO

(reactions, $\text{PbO} + \text{CuSO}_4 \rightarrow \text{PbSO}_4 + \text{CuO}$ and $\text{PbO} + \text{MoO}_3 \rightarrow \text{PbMoO}_4$, application of Tammann's thermoanalysis to)

RN 1317-36-8 HCA

CN Lead oxide (PbO) (8CI, 9CI) (CA INDEX NAME)



CC 2 (General and Physical Chemistry)

IT Thermal analysis

(Tammann's, application to reactions between solid phases)

IT Reactions

(in solid state, application of Tammann's thermoanalysis to)

IT 1317-38-0, Copper oxide, CuO 7446-14-2, Lead

sulfate 7758-98-7, Copper sulfate
(reaction, **PbO** + **CuSO4** .fwdarw. **PbSO4** + **CuO**,
application of Tammann's thermoanalysis to)

IT 1313-27-5, Molybdenum oxide, **MoO3**
(reaction, **PbO** + **MoO3** .fwdarw. **PbMoO4**, application of
Tammann's thermoanalysis to)

IT 10190-55-3, Lead molybdate
(reaction, **PbO**+**MoO3**.fwdarw.**PbMoO4**, application of
Tammann's thermoanalysis to)

IT 1317-36-8, **Lead oxide, PbO**
(reactions, **PbO** + **CuSO4** .fwdarw. **PbSO4** + **CuO**
and **PbO** + **MoO3** .fwdarw. **PbMoO4**, application of
Tammann's thermoanalysis to)